THE MIDLAND NATURALIST

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EDITED BY
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"Come forth into the light of things,
Let Nature be your teacher."
Wordsworth.

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PREFACE.

This volume will, it is believed, be found to contain several papers of enduring interest to naturalists. The Editors would be glad if their staff of contributors included a larger number of those residents in the Midland Counties who are authorities in some branch of natural science. They also invite all who can do so to send notes of carefully made personal observations, which are oftentimes of great value.

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THE MARINE BIOLOGICAL ASSOCIATION.

We have received the first three numbers of the "Journal of the Marine Biological Association." It is the purpose of this article to attempt to engage the sympathy and pecuniary aid of our readers for the Association, by giving some account of its objects and the work it has already done, as set forth in the pages of the Journal.

Historical. — The Marine Biological Association was founded at a meeting called for the purpose in March, 1884, at which there were present, among many other gentlemen of political and scientific eminence, the Duke of Argyll and the Earl of Dalhousie, Professors Huxley, Ray Lankester, and Moseley; Sir John Lubbock, Sir Joseph Hooker, and Sir Lyon Playfair. The objects of the Association were stated in the first resolution, which was to the effect that there was urgent need of one or more laboratories on the British coast where accurate researches might be carried on leading to the improvement of zoological and botanical science, and to an increase of our knowledge as regards the food, life conditions and habits of British food-fishes and molluscs in particular, and the animal and vegetable resources of the sea in general.

As a result of the exertions of the members of the Association, and especially of the Hon. Sec., Professor Ray Lankester, subscriptions were collected, and the War Office was induced to grant a piece of land at Plymouth, on which the Marine Laboratory, the subject of the present article, was erected. It was opened for scientific work on June 30th, 1888.

Constitution of the Association.—The Association is composed of governors, founders, and members. A governor subscribes £500, a founder £100, and a member a minimum subscription of one guinea annually or a composition fee of fifteen guineas. Among the governors are the Universities of Oxford and Cambridge, and the Clothworkers' and Fishmongers' Companies. H. R. H. the Prince of Wales is Patron, and Professor Huxley, President; among the Vice-presidents are the Duke of Argyll, Mr. A. J. Balfour, M.P., and Mr. Joseph Chamberlain, M.P. The governing body is the Council, which is composed of the governors who are life

members and of members elected annually. The Hon. Treasurer is E. L. Beckwith, Esq., of the Fishmongers' Company; the Hon. Sec., Professor Lankester; and the Secretary and Resident Director of the Marine Laboratory at Plymouth, G. C. Bourne, Esq., M.A., Fellow of New College, Oxford.

THE MARINE LABORATORY, which is the first offspring of the Association, is situated on a piece of land between the south wall of the Citadel and the Sound, at a height of 95ft. above sea-level, and about sixty yards from high-water mark. It is formed of two blocks, three storeys high, connected by an intermediate portion of two storeys. In the basement are the engines for pumping sea-water into the tanks. The ground floor of the central portion (70ft. long by 34ft. 6in. broad) forms the aquarium, which contains seventeen large tanks, varying in size from 5ft. long, 4ft. wide, and 4ft. deep up to 30ft. 6in. long, 5ft. deep, and 9ft. wide. The tanks are connected with so-called "circulating reservoirs," which are placed below them, and the latter again with the two main reservoirs which are excavated in the basement rock, and are capable of holding 100,000 gallons. The sea-water contained in the main reservoirs is pumped into the tanks, whence it overflows into the circulating reservoirs, and thence finally back into the main reservoirs. By this means the water is constantly kept moving and in good condition.

The main laboratory occupies the whole of the second storey of the central block; along each side are seven compartments set apart for use by those working at biological problems. Each compartment is 10ft. long by 8ft. wide, and is provided with table, sink, drawers, cupboards, shelves, etc., and is supplied with gas and water.

The side blocks of the building contain two smaller laboratories, as well as a Chemical and also Physiological Laboratories; a "receiving room," where the material obtained by dredging is first brought; a library, and rooms for the director and caretaker.

The Marine Laboratory is entirely under the direction of Mr. Bourne. The Association also maintains a resident naturalist; this post is at present held by Mr. J. T. Cunningham, M.A.

FEES.—Investigations can be carried on at the laboratory not only by members of the Association (who, of course, have the preference), but also by outsiders; the latter and ordinary members pay £5 a month (or £40 a year) for the right to occupy a table; this includes the use of all apparatus belonging to the laboratory and also of the commoner re-agents, but not of microscopes. A governor or founder

is entitled to occupy a table *in propriâ personâ* without payment; a governor if he foregoes this right permanently may nominate an eligible person to make use of a table for one month in each year free of charge.

THE JOURNAL published by the Association has hitherto appeared at irregular intervals, but probably in future will appear every six months. It is supplied free of cost to members, and may be purchased by non-members. The three numbers which have already appeared contain much interesting matter. In the first place there are reports of the various meetings of the Association, and a full description of the laboratory; then there are accounts of the work done at the two Marine Laboratories in Scotland, and by Professor Herdman's Committee, at Liverpool; and last, but by no means least, are papers detailing the various work which has been done at the Plymouth Laboratory since its opening. These papers are of two kinds, the one technical in character, the other of more general and practical interest. In the former category come "Notes on some Animal Colouring Matters," by C. A. MacMunn, M.D.; "Notes on the Marine Oligochæta of Plymouth," by F. E. Beddard; and "On a Tornaria found in British Seas," by G. C. Bourne. With regard to the last mentioned, it is important to notice that *Tornaria* (the larva of the curious *Balanoglossus*, an animal the exact zoological position of which is doubtful) has never before the year 1888 been taken off our English coasts. Thus a very interesting addition has been made to our English fauna early in the history of the Association, affording a promising forecast of what is to come from the labours of those working under its auspices.

The papers of more general and practical interest are as follows:—"The Reproduction and Development of Teleostean Fishes occurring in the neighbourhood of Plymouth," by Mr. J. T. Cunningham; "The Mackerel Fishery in the West of England," by Mr. B. J. Ridge; and "Notes on the Fishing Industry of Plymouth," by Mr. Walter Heape, M.A.

The officials of the laboratory have also been engaged in making a pretty complete list of the fauna and flora of Plymouth Sound, from which we learn that many animals which twenty years ago occurred plentifully in the Sound are found to have migrated further out, and do not now live within the breakwater.

NEEDS OF THE LABORATORY.—But although good work is being done at the laboratory, yet many more and better results would be obtained if the income were larger. The Association has already received, or has in promise, some £15,000, of which £5,000 were contributed by Her Majesty's

Government. About £12,000 have been expended on building and equipping the laboratory. The annual revenue which can at present be counted on is about £950, of which the sum of £500 for four years is granted by Her Majesty's Treasury, on the express condition that the Association concerns itself with economic questions relating to our fisheries. The work which is being done by Mr. Cunningham on the development of food-fishes, and that by Mr. Weldon on the lobster, prawn, etc., fulfils this stipulation in a most admirable way. Investigations into fishery questions, however, can certainly not be exhaustively carried out until the Association possesses a steamboat of its own for dredging purposes. Such a boat, able to resist the heavy weather frequently experienced in the Channel, will cost at least £1,200, and of this sum only about £500 have been subscribed.

It will be well to mention here a few facts about Dr. Dohrn's Marine Laboratory at Naples. This magnificent establishment has cost £20,000; it is completely equipped with boats and dredging apparatus, etc., and maintains a large staff of fishermen and collectors. But, then, it has an income of £4,000, of which £1,500 is subscribed by the German Government, and the rest by various scientific bodies in Germany and elsewhere.

Again, questions of economic interest, and they are many and difficult, need prolonged study on the part of experienced naturalists; men capable of such investigations are, however, often unable to undertake the work owing to pecuniary considerations, and hence some fund is necessary out of which to maintain capable observers. Already one gentleman, Mr. Robert Bayly, of Plymouth, has furnished a noble example in this direction by giving £500 to the Association to be expended in investigating the means of improving the supply of bait for long-line fishermen. May he be followed in his munificence by many others!

Another department of the laboratory which greatly needs assistance is the library. In pursuing any scientific investigation it is very necessary, first of all, to learn everything that is known on the subject; obviously, this is impossible without the aid of a good library. At present it is arranged that a sum of £100 a year is to be expended on books; but this is a sum totally inadequate to the purpose; for to purchase the current periodical literature alone of biology would swallow up a far larger sum, without considering works on British fauna and flora, monographs on important groups of animals and plants, and works on fisheries, many of which are very expensive. The nucleus of a good library has already been formed, partly by purchase, but more largely by

donations from Governments, societies, publishers, and private individuals. Presents of biological works from those who either make little use of them themselves, or possess duplicates, will be gratefully received and acknowledged by the Secretary of the Association.

Objects of the Association.—Many of our readers will not require to be told what great advantages must accrue to both pure and applied biological science from the investigations carried on at the Plymouth Laboratory, but others may perhaps ask why they should be called on to support such an institution as that of the Marine Biological Association, the objects of which they do not understand. It will now, therefore, be our endeavour briefly to indicate what important results the Association hopes to achieve.

It will not be necessary to the purpose of this paper to insist on the great value the Marine Laboratory at Plymouth will be to English naturalists engaged in solving biological questions of purely scientific interest, nor to deplore the hindrance to such enquiry during the past entailed by the lack of a suitable establishment of the kind on our shores. It is sufficient to say that the marine laboratories of France, Germany, Austria, Italy, and America have produced results of the highest value to science, with which English naturalists may now hope to compete even more successfully than hitherto. One example will show how the establishment of marine laboratories on our coasts will benefit science: Professor Moseley stated at the preliminary meeting in 1884 that the development of even the common limpet was unknown owing to the difficulties of hatching out the eggs and rearing the embryos from the lack of necessary apparatus on the spot. Now we have good hope that *lacunæ* in our knowledge of this kind will soon be filled up.

Turning aside then from the purely scientific aspect of the subject, we will attempt to indicate briefly the important aid which will be given to the development of our fisheries by investigations carried on in marine laboratories. But while we shall endeavour to enlist the sympathies of the reader for the Association on the lower ground of the immense aid it will give in settling economical questions, we would have him bear in mind that it has again and again happened that results of the greatest utility have been produced by scientific investigations which once had apparently not the slightest practical bearing, but were of the most abstract character.

Investigations into fishery questions to be of real practical use must be carried out in the strictest scientific manner; when this is done, the results are most happy. For example:

the grey cod used to be a winter fish only in the bays of the United States, going in the summer to Newfoundland for the cooler waters of the Arctic stream. Science, however, has been able to alter this habit. Under the direction of the Commission of Fisheries of the United States Government, the artificial incubation of cod-spawn is carried on with perfect success, although there are great difficulties in the way from natural enemies, etc. The cod thus artificially bred are attached to the place of their birth, and do not know their way to Newfoundland, and therefore keep to the shores of the States, and are now freely caught in the summer. Such a result, however, could not have been attained without much preliminary investigation into the conditions under which the cod-spawn develops, and the investigation could not have been made except by properly trained scientific experts, with properly equipped laboratories at their command.

Again, the shad, which in America is largely used as food, was formerly subject at times to great diminution in numbers, greatly, of course, to the injury of both fisherman and consumer. Scientific investigation has now shown that the shad spawns on the sea-coast when the water is at a temperature within a few degrees of 60°F.; if, however, cold rains lower the temperature to 55°, or hot weather raise it to 65°, the shad run out to sea to spawn, and four years afterwards there is a famine. This occurs no longer, as the Commission vessels now follow the shad to sea, secure the eggs, and hatch them artificially. These two instances will show how successfully scientific research and methods can be applied to the solution of practical problems, It remains to mention a few of the many problems connected with fisheries which are still unsolved.

One very pressing question is why fish have deserted the inshore districts and gone to sea. At present no reason can be assigned, but scientific research will no doubt soon give us an answer; and, on the other hand, we learn from such examples as those given above that much may be done by artificial hatching and rearing to recruit the inshore fisheries.

Again, little or nothing is known about the development and conditions of life of many fish which are of great importance as food, for instance, the conger. There is obviously a wide field for research here, which promises the happiest results.

Another subject of moment relates to the bait used for long-line fishing, an industry of considerable importance, conger, ray, skate, cod, and pollack being caught by this means. Squid is the principal bait, but pilchard, mackerel,

herring, etc., are also used, according to the season, and in case of scarcity of squid. A single line, or "bulter," carries some 1,666 hooks; when squid are cheap it costs 3s. to bait one line; when they are dear, £3 12s. If pilchards are used, when they are cheap the cost is 5s.; when dear, £2 10s. It is estimated that at Plymouth alone £4,500 are spent every year on bait. From these data it will be seen how important it is to procure bait in plenty. The supply, however, especially of squid, is very irregular, for it depends on the trawlers; if bad weather prevents them from going out, the long-line fishers have no bait; if calms prevent the trawlers getting back to port, the bait spoils and is of no use for fishing purposes. Hence the possibility of artificially breeding squid, or of preserving it in such a manner as not to be distasteful to the fish, is a question of high moment which it is very desirable should be settled. In connection with the latter part of the question it is interesting to learn that at the Marine Laboratory of St. Andrew's University on the Scottish coast, experiment has shown that boro-glyceride can be used for preserving mussels without apparently impairing their usefulness as bait.

The temperature, density, and chemical composition of sea-water all have a most important influence on the life of fish, especially during the development from the egg. Thus it seems probable that the eggs of certain fish—the mackerel for example—live and develop properly only if they float on the surface of the water; if the density of the water is such that they sink, then they die. This being so, then, if the density of the sea of a given district had been lowered in any way, the spawn of that year might, to a great extent, be destroyed, entailing a scarcity of adults in some future year, which, on the other hand, might be prevented by artificial breeding of the fish. Thus, there is plenty of work to be done in determining the relation of the temperature, density, and composition of sea-water to the life conditions of important food-fishes.

Enough, we hope, has now been said to show of what almost incalculable value in the solution of fishery questions is the application of scientific method and research. This is impossible except with the aid of marine laboratories like that at Plymouth, and their existence depends almost entirely on the support received from the general public. But while asking for their support, we would also impress on our readers the necessity of bearing in mind that it often takes a long time successfully to carry out investigations such as we have been describing, and therefore they must not

be surprised if the payment of a guinea subscription is not immediately followed by the fall of native oysters to popular prices. The rapidity with which practical results will be attained will be in direct proportion to the completeness with which the special scientific research required has been carried out, and in the latter condition time is an important element. The possibility even, however, of complete scientific research is, as we said, almost entirely dependent on the pecuniary support given by the public; and this, we trust, the Marine Biological Association will largely receive, greatly to the advancement of pure science, and the solution of important economical questions.

A. B. B.

SOME NOTES UPON A PROPOSED PHOTOGRAPHIC SURVEY OF WARWICKSHIRE.*

BY W. JEROME HARRISON, F.G.S.,

VICE-PRESIDENT OF THE BIRMINGHAM PHOTOGRAPHIC SOCIETY; AUTHOR OF THE "HISTORY OF PHOTOGRAPHY;" "PHOTOGRAPHY FOR ALL," ETC.

My subject may be considered as an extension of a paper which I read before the Birmingham Photographic Society in June, 1885, on "The Work of a Local Photographic Society."† Permit me to quote two paragraphs from that paper :—

"Within the last few years photography has made a new departure. The introduction of gelatine dry plates and films has made the process so clear and—by comparison—so easy, that photographers have multiplied a hundred fold. Oh! that we could bring back Daguerre with his costly silver plates, which required such tremendous polishing; Fox Talbot with his calotypes, and Scott Archer with his wet collodion plates, silver bath, and travelling tent, which made the landscape-photographer's life a burden to him, and show them our light and complete equipment, with which a man may travel round the world, and leave—if he pleases—his pictures to be developed by his grandchildren, with every assurance that, if preserved with reasonable care, they will turn out all right, even after the lapse of years."

. . . .

* Read before the Birmingham Photographic Society, December 11th, 1889.

† "Photographic News" for July 3rd, 1885.

"Much useful local work may be done by a photographic society. By securing accurate representations of old buildings we can furnish a record for posterity, whose accuracy cannot be disputed, and whose interest in the future will be great. But I would not only photograph the old buildings—I would secure on rapid plates impressions of the daily appearance of our streets, of the principal lines of thoroughfare, and of the busy crowds by which they are traversed. Even in the half century which has elapsed since the discovery of photography, if such pictures could have been secured of Birmingham at intervals of every five or ten years, what an interest they would have for us to-day! We exclaim at the pleasure it would give us if we could see photographs of Stratford-on-Avon as it was when Shakespeare lived there; but there will come a time when a similar desire will be expressed to see England as it was in 1885; and, fortunately, by the aid of photography, it will be possible for such a desire to be gratified."

Since the paper from which the above quotations are made was written, I have more than once spoken at meetings of the Birmingham Photographic Society, urging that it was the duty of the Society to undertake local work, such as a photographic survey of the district surrounding its head quarters; and during the present year I have urged that this district should be the county of Warwickshire.

A few weeks ago a deputation from this Society went to Sutton Coldfield, there to address the local scientific society known as the Vesey Club. There again I ventured to air my idea; and it was very warmly taken up by the meeting, and especially by the vice-president of the club (J. B. Stone, Esq., J.P., F.L.S., F.G.S.), who has since become the president of the Birmingham Photographic Society. Encouraged by his support, the following memorial was presented to the Council of the Society:—

"That the Council be requested to call a special general meeting to consider the feasibility of a photographic survey of Warwickshire, the object being to secure an accurate and unbiassed record of the scenery, monuments, life, natural history facts, &c., of our county as they now exist."

This was signed by a large number of members, and was laid before the Council of the Society; and it is for its consideration that this meeting has been called. Invitations have been issued to all the photographic, literary, artistic, and scientific societies in the county, and we are much pleased to see their representatives here to-night.

Within the last two years the idea of a local photographic survey has been carried out to some extent by the Boston Camera Club, in America, and by the Birkenhead Photographic Association in England. The Boston Society has secured a number of negatives of what they call "Old Boston;" and from these negatives lantern-slides have been prepared, one set of which has just been going the round of the English photographic societies. The Birkenhead Society took up* the archæological survey of the "Hundred of Wirral," a division of Cheshire; and we shall, I believe, see some of their results (in the form of lantern slides) after Christmas.

Other societies—non-photographic—have seen the need and value of photographic records, and have taken steps to secure them. Ever since 1870 the Archæological Section of the Birmingham and Midland Institute has been endeavouring to secure photographs of all local objects which were likely to suffer change—as the old streets of Birmingham, so many of which have been swept away under the Improvement Act—Dr. Priestley's house, Francis Eginton's house (both since pulled down), and many other places of interest. In their excursions they have also utilised the services of their official photographer—our good friend Mr. Harold Baker—and as a result they have now a valuable and most interesting collection of local photographic negatives.

At the Conference of Photographers held in London in 1888, under the auspices of the Camera Club, I advocated the appointment, by Government, of "State photographers, who should be specially charged with the task of obtaining authentic portraits of our great men [and securing pictorial records of historical places and events]. The time must come when the present era will be history, and authentic photographic records will then be invaluable."† In closing the conference, the President of the Camera Club, Captain Abney, F.R.S., etc., said:—"He thought Mr. Harrison's idea of a State photographer a most excellent one."

At the recent meeting of the British Association at Newcastle-on-Tyne (September, 1889), a committee was formed for the collection, preservation, and systematic registration of photographs of geological interest in the United Kingdom; Mr. O. W. Jeffs, 12, Queen's Road, Rock Ferry, Cheshire, being appointed secretary. This committee has just issued a circular asking for the "names of local societies or persons

* See "Photographic News" for May 18th, 1888.

† "Journal of the Camera Club" for March, 1888.

who may be willing to further the objects of the committee in their own districts." As the author of the first book on geology*, which was (so far as I know) illustrated by photographs, I feel an especial interest in this scheme, and it is clear that it would be a part of any complete local photographic survey.

A Photographic Survey.

It is proposed to consider the subject of a photographic survey mainly under two heads :—

I.—Have we, in our neighbourhood, a natural region or district which contains material for the work contemplated under the head of a "Photographic Survey ?"

II.—Supposing this to be the case, how should such a survey be organized and conducted ?

It may be taken for granted that a Photographic Society, such as our own, will be doing a good and useful work if it endeavour to secure a pictorial record of local objects and events. The question then arises, what is the best area or region to select as the unit of work? I think there can be no question but that—for England at all events—this unit should be the County ; or divisions of a county, as the Hundreds. Every Englishman knows his county well ; he is familiar with its extent, its boundaries, towns, industries, etc. Men from the same county have a clannish feeling ; and when two Englishmen meet abroad, if they are both from the same county they feel almost like brothers. This fact has lately been recognised by Government in assigning territorial designations to all the regiments of our army, so that we speak of the "North Warwickshire Regiment," the "South Essex," etc.

Some have suggested that we should take a certain radius—say twenty miles—from our town, as the area to be studied. This would give us a circle, and would include portions of half-a-dozen counties. But who cares for "the country round Birmingham ?" while Warwickshire is a name to conjure with !

Again, we hope that this scheme will be taken up by the hundred photographic societies which now exist in Great Britain. If the unit of work be a circle, then great gaps will be left between the circles ; but every one who has played with a "puzzle map" knows that when the counties are fitted together they make up the entire country.

*The Geology of Leicestershire and Rutland ; illustrated by twelve photographs (from whole plates). Leicester : J. and T. Spencer, 1877.

THE COUNTY OF WARWICK.

Let me first endeavour, then, to give you a brief description of the proposed subject of our photographic survey, in order that you may see how worthy it is of your best energies, your utmost exertions. As Wordsworth writes :—

> Come forth into the light of things,
> Let Nature be your teacher.

"Woody Warwickshire"—"that shire which we the heart of England well may call,"*—lies truly in the very centre of the land ; for lines drawn from Berwick-on-Tweed to the Isle of Wight, from Dover to the Isle of Anglesey, and from the Severn to the Humber, all intersect in this central county. And Warwickshire forms the watershed, as well as the centre of England. Its southern stream—"the soft-flowing Avon" —passes to the south-west to join the Severn at Tewkesbury ; while its northern stream—the Tame with its tributaries, the Rea, Cole, Blythe, etc., runs north-east into the Trent, and so ultimately mingles its waters with those of the German Ocean. In places, the banks of these streams are beautifully wooded (the Cole, for example), affording the most delicious "peeps" as the river meanders ; while they are often crossed by old-fashioned bridges, and lined by gnarled willows and osier-beds.

Nowhere does the surface of Warwickshire attain to any great elevation. In the north-east of the county the Hartshill range, which extends from Atherstone to Nuneaton, does not exceed 600 feet in height, while the Edge Hill range in the south-east barely attains 800 feet.

The area of Warwickshire is 897 square miles, and its population about three-quarters of a million. Panoramic views, embracing large areas, should be taken from all the principal elevations, and from church-towers, etc. In such work, the lighting must be carefully studied ; and the use of ortho chromatic plates, aided by a yellow screen, will sometimes be found an advantage, doing away with the misty or hazy effect, which in this climate almost invariably envelops distant objects. Such "haze effects" are often invaluable to the photographer in giving the idea of distance ; but when the object is to get a panoramic map, it is well to be able to remove the hazy appearance at will.

The most marked feature of the county of Warwick at the present day is the prevalence of woods and forests. Fine parks containing much magnificent timber abound, and include about fourteen deer-parks. The hedge-rows every-

* Michael Drayton, in the "Polyolbion," xiii.

where contain well-grown trees, while the hedges of the country lanes are of remarkable height and thickness. The fact is, that all Warwickshire north of the Avon formed part of that mighty "Forest of Arden," which once stretched northwards to the Trent, and included large parts of Worcestershire, Staffordshire, and Leicestershire. The picturesque small town of Henley-in-Arden, and the village of Hampton-in-Arden, still preserve this title, which was the Celtic name for a forest.

PREHISTORIC WARWICKSHIRE.—The name "Arden" thus at once takes us back to a period before the Roman invasion. This part of England was then a dense forest, scantily peopled by the "Ancient British" tribes called the Cornavii and the Wiccii. They were probably herdsmen, grazing their flocks of sheep and herds of cattle or swine in the clearings and glades of the forest which they knew so well. What remains of them to us? Very little, indeed, that is certain. Some of the mounds or tumuli may be the burying places of their chiefs; others, surrounded by oval or circular entrenchments, and occupying hill tops, are remains of their fortresses or camps.

The name of the county and that of its central town—Warwick—may be derived from the Celtic *Gawr*, a fortified place, and *Wiccii*, the tribe by which that high mound which at Warwick overlooks the Avon, was raised and defended.

ROMAN WARWICKSHIRE.—As Julius Cæsar (B.C. 55) did not advance north of the Thames, his famous "Commentaries" tell us nothing directly of Central England. But a later Roman leader, Ostorius Scapula, established a line of forts along the Severn in A.D. 50; and he and his successors during the next four centuries made those famous "Roman roads" which were indispensable to the conquest of the country. Three famous Roman roads run through Warwickshire. The most important is the Watling Street, which extended from Richborough in Kent, to Chester. It enters Warwickshire near Rugby, and from thence to Atherstone it separates the county from Leicestershire. At High Cross, about half way between the two towns, the Watling Street is crossed by another Roman road called "The Fosse-Way," which extends thence to Stretton-under-Fosse, in the southwest of Warwickshire, a distance of forty miles. It runs in a nearly straight line, up hill and down dale, with deep cuttings and many picturesque views; a true "old-world" road, and but little frequented now. Who will walk its length with a camera, and resuscitate the Roman? I knew this "old Fosse Road" well when I lived in Leicester, and anti-

quaries have traced it all the way from Cornwall to Lincoln.

But the Roman road best known to dwellers in Birmingham is the Icknield Street (or Ryknield Street as it is sometimes called to distinguish it from another road of the same name). It enters the county in the south at Bidford, and runs nearly due north through Birmingham (where one long street still bears the name), to meet the Watling Street at Wall (the Roman station of Etocetum), near Lichfield. For three miles in Sutton Park, on the north of Birmingham, the line of this fine old road is quite distinct as to direction, width, and level, although it is, of course, grass-covered. Beyond Warwickshire, this Ryknield Street extended to Gloucester and St. Davids in the one direction, and to the Humber and thence to the Tyne in the other.

Besides the Roman roads, practically the only certain traces left of the Romans in Warwickshire are the Roman rectangular camps or fortified stations at Manduessedum (close to Mancetter), and at Oldbury, in the same district; with another at Chesterton, on the Fosse-Way, six miles south-east of Warwick. These camps are well-defined grassy mounds or "walls" of earth, enclosing a large central area. They will not be easy to photograph, and the best time for securing their outlines will probably be either early or late in the day, when shadows will accentuate their outlines.

Other important Roman stations are believed to have existed at Præsidium (Warwick), Tripontium (Cave's Inn, near Rugby), Alauna (Alcester), Bennones or Vennones (High Cross or Cloudesley Bush).

Roman remains, coins, pottery, etc., have also been dug up at Brinklow, Monk's Kirby, and Wibtoft. These latter relics appear to have been dispersed, and are probably now lost to us. They could all have been preserved and collected for purposes of study by their reproduction by photography. In the Warwick Museum there is a Roman tomb or sarcophagus, found near Alcester.

(To be continued.)

THE PROCESSES OF CRYSTALLIZATION IN ROCKS.*

BY T. H. WALLER, B.A., B.SC.

The following notes are an attempt to gather into a short compass a description of the various results, both in character and texture, of the solidifying of a melted mass consisting of

* Read before the Birmingham Natural History and Microscopical Society, January 25th, 1887

silica with the bases alumina, oxide of iron, lime, magnesia, and the alkalis, and to show how the varying conditions of cooling have affected the resulting crystallization.

In the first place we will consider the case of a perfectly melted mass, poured out as a stream of lava and losing heat by radiation and conduction.

Fouqué has shown experimentally that the behaviour of such a cooling mass will vary considerably, according to the temperature at which it has been maintained previous to eruption. He found that a mass which was quickly cooled from a temperature considerably above its fusing point solidified to a glass with no appearance of crystallization; but if it has been kept for some time at a temperature which just does not permit of solidification, then on pretty rapid cooling crystals of one or more species are produced. This condition may be obtained naturally when the mass is injected among strata or in dykes—the cooling will then be so slow that the process of elaboration will go on and the various minerals will separate out. At the very edge of the dyke, however, there may be a layer so quickly cooled as to solidify at once to a glass. These experiments were all made on basic rocks as they are so much more fusible and generally manageable. In the course of gradual cooling, the first substance which separates in basic masses—by which term those containing not more than fifty per cent. of silica are meant—is magnetite.

Following this the magnesian silicate, olivine, is always formed. It encloses the magnetite occasionally and portions of glass, but never the minerals which follow. The order of the crystallization of the remaining chief constituents of the basic rocks, augite and felspar, varies according to some unknown variations of condition. Sometimes the augite is present in well-defined crystalline grains, entangled as it were in a network of crystals of felspar; at other times the augite forms broad plates with the felspar crystals embedded in them, or apparently indenting their edges. In the former case the augite has apparently solidified first, in the second case it is evident that it must at all events have *finished* crystallizing after the felspar.

In the case of the felspars, we very often find that on examination in polarized light there is evidence that, though there is no visible separation, the chemical composition of the various zones, which have been successively added in the process of crystallizing, has been different. This is shown by the fact that the position of the optic axes is different in the different zones, so that they do not all become dark

together on rotating the section between crossed nicols prisms. The order which has been given is that of the most basic separating first, and this appears to be the almost invariable rule. It obtains also in the acid series in cases where the solidification has proceeded slowly, under great pressure and in presence of more or less water, as in the case of the granites. The general order here is mica (or hornblende), felspar, quartz, notwithstanding the very refractory character of the last named mineral. There are several circumstances, however, which prove that the solidification of granite is not due to such processes as we can imitate :—

1.—Neither mica, hornblende, orthoclase, or quartz have ever been formed artificially by cooling from dry fusion.

2.—The obvious presence of water in the cavities of the quartz proving a very great pressure.

3.—Where granite has formed veins which have more nearly reached the surface, as in some cases where they are traced into quartz felsites, the character of the crystallization is quite altered.

In all these cases we have only had under our notice rocks which have been subjected to only one tolerably uninterrupted process of cooling. In many cases, however, we find obvious differences between two sets of crystals in the same mass. We may have, for example, a mass of small, almost needle-like, crystals of felspar, with small augite grains forming a dense mass in which isolated crystals of felspar of much larger size are embedded, constituting the structure which is called porphyritic. Here the larger crystals are plainly anterior to the smaller crystals of the so-called base, and have certainly formed under quite different conditions. The evidence points to the formation of these porphyritic crystals while the mass was still subterranean, and, therefore, cooling with great slowness, which would favour the regularity of their growth. They were on eruption already contained in the fluid mass, which has solidified as a mass of small crystals on account of the relatively rapid loss of heat when it was exposed to surface cooling agencies. One proof of the existence of these crystals prior to eruption may be found in the often observed circumstance that when the mass forms a dyke, although the texture of the base frequently varies from almost microlithic at the sides to fairly coarse-grained in the centre of the dyke, the distribution of the larger crystals is usually quite uniform, as many being met with near the edge as further in. Here, again, it is often observed that the felspars of the first consolidation or generation, as they are

called, are of more basic composition than the later ones. In a few cases a further separation has been effected of the constituents of the rock, and the part which last consolidated (in these cases as a glass) has been analysed, with the result of showing that it contains a considerably larger percentage of silica than the average of the rock. For instance, in the case of a dyke examined by Mr. I'anson, as noticed by Mr. Teall, Q. J. G. S., 1884, p. 225, the general analysis of the rock showing about 58 per cent. of silica; the glassy base contained 70. I have also called attention to somewhat similar relations in the case of certain so-called segregation or contemporaneous veins in the rocks of Penmaenmawr and Rowley. Mr. Teall has further suggested (Geol. Mag., Mar., 1885) that certain of the quartz felsites of the Cheviot district may be represented as, so to speak, the mother liquor out of which some of the more basic porphyrites, &c., have been separated.

Individual crystals frequently show by the arrangement of the glass fragments they have enclosed that the rate and regularity of the growth of the crystal has varied. Thus we frequently find the central parts of a crystal pretty free from included masses, while the outer zones contain many or *vice versá*. Occasionally the inclusions are arranged in several zones alternating with zones which are almost perfectly clear. In one slide in my collection this is repeated six or seven times.

Another slide has an arrangement which does not come under this head. The basalt which is used as road metal in Sydney contains porphyritic crystals of felspar of considerable size. One of these, furnishing a section of about $\frac{1}{4}$in. long and $\frac{1}{20}$in. broad, is divided into two very distinct halves, one of which swarms with inclusions of brown glass of elongated shape lying parallel to the sides of the section, while the other half of the section is almost free from any inclusion at all.

If now we inquire as to the processes which initiate the formation of crystals, we shall find the best materials for study among those rocks which have a portion, whether larger or smaller, in the condition of glass. In such a glassy rock we frequently find minute rounded bodies which appear to be the primary effort towards crystallization, although they show no action on polarized light. To these bodies Vogelsang, who studied the subject both in natural and artificial products, gave the name of globulites. These globulites are often found combined together in strings, either retaining their individual shapes or sometimes combined to minute cylindrical rods which have received the name of longulites.

The formation of globulites was studied by Vogelsang in mixtures of sulphur and Canada balsam dissolved in bisulphide of carbon. As the solvent evaporates the sulphur tends to crystallize, but the viscidity of the Canada balsam prevents this taking place at once, and globulites are formed which apparently remain fluid for some time and can be observed to take on crystalline form at the instant of combining with a crystal in process of formation.*

These elementary forms when further grouped together form minute bodies which are now in many cases recognizable as crystals, though it may be impossible to determine their species with certainty. These are grouped under the general name of microlites, and they can frequently be detected as it were in the very act of building up a recognizable crystal. This larger crystal may under such circumstances consist of a mere skeleton of the actual mineral, while a great part of the enclosed space is occupied by the glassy ground mass of the rock.

It is the microlites, with their wonderful grouping and suggestive relationships, which give so much charm to the glassy rocks. The grouping in many cases is very beautiful, and perhaps of all the beautiful examples the most lovely are to be found in the fernlike groups of hornblende microlites which occur in some of the pitchstones of Arran. A very noticeable feature in this rock is the clear colourless space round each group. The fine dusty material which fills the main mass of the glass, and which is seen under high powers to be composed of extremely small needles, felted together in such quantity as to make parts quite opaque, has evidently been used up in the formation of the aggregates of microlites. A somewhat similar phenomenon occurs round the spherulites in the artificial glassy basalt produced by Messrs. Chance, of Oldbury, some years ago by melting Rowley rag. Where the spherulites have been formed in the process of annealing, they are surrounded by a space of which the colour is very much lighter than that of the very dark brown glass, which is the general result of the experiment.

Such specimens as the two last named show us very plainly what an amount of molecular mobility there must be in a mass which is already cool enough to be practically solid. We may group such observations with others on the annealing and devitrification of glass, where, without the shape of the mass being at all altered, there has been sufficient molecular freedom produced to allow of considerable

* See Vogelsang's "Die Krystalliten."

rearrangement of the molecules, and also with the observations and experiments of Fouqué cited above, on the artificial formation of minerals.

In the glassy rocks we frequently find approximately spherical or spheroidal masses of stony aspect which are called spherulites. These are of various kinds ; some consist of the globulites previously mentioned, simply aggregated into masses something like little blackberries—these are called cumulites. In the most typical, however, the elements of the spherulite are distinctly crystalline and arranged radially, so that in polarized light they show a dark cross. If the crystalline elements are either less strictly radial in position, or consist of some mineral in which the directions of extinction are not in every section parallel to the length of the crystal, or finally if they are of different minerals, the optical behaviour of which is different between themselves, the black cross is not seen. Spherulites often seem to be the latest production in the glassy rocks, for they are frequently attached to and enclose more or less completely the larger crystals, and where there are streams of microlites we can usually trace these right through the spherulite, proving that this has been produced after the stream of minute crystals. Occasionally spherulites coalesce to bands, or even spread through the whole substance of the rock. A capital instance of the latter is seen in the spherulitic felsite of corriegills, shore in Arran.

NOTE ON THE MORPHOLOGY OF THE GONADS IN *HELIX* (*MACULARIA*) *PUNCTATA*, MÜLLER.*

BY JOSEPH W. WILLIAMS.

Mr. W. D. George, of Charlton, London, S.E., having sent me a living specimen of a *Helix* which he collected at Buenos Ayres, in October, 1888, and which I find is referable to the *Helix* (*Macularia*) *punctata* of Müller, I dissected out the gonads—the subject of the present communication. I need not here sketch the morphology of the generative apparatus of a typical Anisopleural Gastropod, since I have already done this in my "Land and Fresh-water Shells," and it will also be found in the majority of our

* Mr. George informs me in an accompanying letter that this species is largely eaten by the Italians in Buenos Ayres, and he testifies from practical experience "that when cooked with oil and garlic they are exceedingly palatable."

elementary biological text-books; I shall therefore pass directly to my subject without further note.

The genital aperture is placed in the position which generally obtains among the Stylommatophora. The ovotestis is white, follicular, and small; it lies in the left lobe of the gland of the mid-intestine in the apical whorls of the spire. The hermaphrodite duct is long, thin, and somewhat brownish, and leaves the ovotestis as a convoluted tube, which, after running through the left gland of the mid-intestine, passes underneath the stomach to the left side of the coelom, and then, being applied to the side of the albuminiparous gland, it becomes straight and enters that gland by a knobbed extremity to unite with its duct, and become the common generative canal. The albuminiparous gland is linguliform and yellowish-white; it is placed between the right lobe of the gland of the mid-intestine and the stomach. The common generative canal is long; it arises from the albuminiparous gland between the right lobe of the gland of the mid-intestine and the stomach; it runs over the stomach, and lies to the right of the crop; it is twisted on itself in its course, so that at one portion of the duct the male part is ventrally, at another dorsally placed; the male portion is a thin dull-white and thread-like tube intimately connected with the female portion, which is larger and has its characteristic foldings and puckerings well marked, the division between each puckering being well shown by the interposition of a translucent connective tissue septum. There are no naked-eye indications of a prostate. The vas deferens is exceedingly small at its commencement, and takes a coiled course by the side of the oviduct, but slightly ventral to it; it runs anteriorily by the left-side of the dart-sac, and, turning on itself in the angle formed by the junction of the penis and vagina, it courses backwards on the right side of the penis, and, becoming thicker where the flagellum is given off, becomes directly continuous with the penis. The oviduct is long, large, and coiled many times upon itself; it runs on the right side of the œsophagus and crop, and after passing underneath the spermatheca, it joins this duct on its ventral aspect to form the vagina. The Swammerdamian vesicle—the globular head of the spermatheca—lies directly in front of the anterior end of the right lobe of the gland of the mid-intestine, and under the posterior end of the nephridium, being separated from this last-named organ by the interposition of the hinder part of the muscular floor of the mantle-cavity; it is a reddish, rounded, globular expansion, and is seen in this specimen to

contain a spermatophore. It lies to the left of the stomach. Its duct—or spermatheca—crosses over the female portion of the common generative canal, becomes intimately related with it for some portion of its course, and then leaves it, recrosses over the female portion of the common generative canal, and courses down its left side, lying in relation with the œsophagus, to join the oviduct in the formation of the vagina. As in *Helix aspersa* and others of this genus, there is a diverticulum given off from the duct; but in this specimen there was no indication of a globular head; it ran in company with the common generative canal, and ended blindly near the albuminiparous gland. The digitate glands are biramose, and arranged in two sets; the dorsal set opening into the dorsum of the vagina posterior to the opening of the dart-sac, the ventral set opening into the vagina on its ventral aspect directly opposite the opening of the dorsal set. In each set there are six tufts. The dart-sac lies on the right side of the body, and is separated from the buccal mass by the dorsal set of the digitate glands and the flagellum; it is of an elongated pyriform shape, and, comparatively speaking, small. In this specimen, though captured in the spring of the Argentine Republic, there was no spiculum amoris present. The flagellum is exceedingly short (2 cm. in length) and correspondingly stout; it possesses a special retractor muscle similar to what Ashford has described as obtaining in *Testacella haliotidea;* it lies on the right side of the buccal mass and the penis, and is coiled once upon itself in the dorsal set of the digitate glands. The penis is long, rounded, and cylindrical; it lies on the right side of the buccal mass at its anterior extremity and ventral to the retractor muscle of the right tentacle; its hinder end curves over the posterior portion of the buccal mass, lying partly on it and partly on the œsophagus, and separated in this position from the dart-sac by the digitate glands and flagellum. Its retractor muscle is long, and passes over the œsophagus to unite with the left lateral walls of the prostoma.

In comparison with the reproductive apparatus of our English Helices it is worthy of note that in this species there exists no naked-eye indication of that fluffy mass around the male portion of the common generative canal which is generally known as the prostate; that there is present a special musculus retractor flagelli, and a diverticulum from the spermatheca which may be regarded as a secondary spermatheca. The short and correspondingly stout flagellum which is coiled only once upon itself, and the relation of the albuminiparous gland to the stomach, are also worthy of note.

THE LATE MISS CONSTANCE C. W. NADEN.—It is with the deepest regret we announce the death of this lady, which occurred at her residence in London, on Monday, December 23rd. The deceased lady was the daughter of Mr. Thomas Naden, architect, of Birmingham. After completing her ordinary education, Miss Naden became a student at the Mason Science College, where she was most successful and popular. She devoted much time to artistic and literary work, and has given great promise as a writer on philosophical and kindred subjects, as the pages of this magazine give abundant proof. Miss Naden took great interest in sociological questions, and was an ardent member of the section of the Birmingham Natural History Society which devotes itself to the study of the Spencerian philosophy. In our February number we hope to print the last paper she read before this section on the 29th October last, entitled "The Principles of Sociology." She published two volumes of poems which have attained considerable popularity.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION MEETING, December 3rd, 1889. The President, Mr. W. B. Grove, M.A., in the chair. Mr. W. H. Wilkinson exhibited the fruit of *Pyrus* (*Cydonia*) *japonica*, which was similar to an apple in form, and measured 2 inches in length, and 5½ inches in circumference; also an abnormal branch from the same tree, the wood of which was three times the diameter and many times longer than the normal branches, and the bark of lighter brown colour. Also the following fungi growing on a currant branch: *Sphæria pulvis-pyrius* and *Agaricus velutipes*, of which Mr. Grove said the latter was one of the few not injured by frost, and was common on dead wood during the winter months.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—November 18th, Annual Exhibition. The exhibits, which were too numerous for the room, included a collection of local plants by Mr. J. Collins; fungi, by Mr. Camm; land and fresh-water shells, with foreign varieties and photographs of local scenery, by Mr. J. Madison; minerals and coal measure fossils, by Mr. Corbet; Silurian fossils, by Mr. Lassetter; Eocene fossils and butterflies and moths, by Mr. P. T. Deakin; a large collection of caddis cases, also a series of seaweeds, and British, African, and New Zealand ferns, by Mr. H. Hawkes; butterflies and moths, by Mr. C. P. Neville; birds, including specimens of night-jar, heron, and snowy owl, the latter from North America, by Mr. J. Betteridge; British reptiles, by Mr. F. Shrive; marine shells, &c., by Mr. Linton. There was a good show of microscopes, under which many interesting objects were placed. In the course of the evening, the President, Professor Hillhouse, M.A., F.L.S., delivered a short address, in which (after giving a hearty welcome to visitors) he spoke of the importance of developing the faculties nature had endowed us with, faculties that were often less developed in us than similar ones in the lower animals, and that no

study was so advantageous for this purpose as natural science.—November 25th. Mr. J. Betteridge presented specimens of the common heron, *Ardea cinerea*, and wheat-ear, *Saxicola œnanthe*, to the collection of the society, for which hearty thanks were passed. Mr. J. Collins then read a paper on "Filamentous Fresh-water Algæ." The writer referred to some of the benefits students of botany and biology derive from a careful study of these minute plants, their simple cellular structure demonstrating very beautifully the manner in which plants grow by cell-division. One of the greatest difficulties to their study is the lack of literature on the subject, a good work, at a moderate price, being much needed; the only one we have is beyond the means of many working naturalists. The various modes of reproduction, both sexual and asexual, were referred to at some length, special consideration being given to the very elaborate method of sexual reproduction. Several species were mentioned for their extreme beauty. The habitats of algæ were very variable, such as damp ground, stagnant ponds, clear streams and cascades. The paper closed with an account of the important position these plants hold in the organic world as purifiers of water, &c. A number of species were shown under microscopes, and a collection of drawings handed round. —December 2nd. Mr. T. H. Waller, B.A., B.Sc., gave a description of the various rock sections he presented to the cabinet of the society. He said they had been specially chosen to show the different types of rock structure. One, a limestone of Silurian age, showed foraminifera; the junction of granite and schist was well seen in a specimen of Cornish granite; the other slides included porphyritic rock from Whitby, Mexican quartz, containing fluid carbonic acid and water in cavities, roche and bluestone from Rowley Regis, showing their identity.

OXFORD NATURAL HISTORY SOCIETY.—December 3rd. The President in the chair. Mr. W. Warde Fowler gave a very interesting account of the habits of two of the warblers observed by him in the Alps for several years past. The first of these was the Marsh Warbler (recently recognised as an Engligh bird), which shows an almost absolute identity in form and plumage with another species, the Reed Warbler, so that dead specimens of the two are indistinguishable, while in habit, gesture, song, nest, and eggs, the two species are quite distinct, and never interbreed. From this a conclusion was suggested that plumage ought to rank less highly as a specific character than it commonly does. Mr. Fowler then described the habits of Bonelli's Warbler, chiefly observed by him on the lower thousand feet of the mountains bordering the Hasli Thal. This species is closely allied to the Wood Warbler, and is considered likely to push its way into England, as its European range has been observed to be extending northward, and has been traced from Italy to northern France. In the discussion which followed, stress was laid on the fact of permanency of habit often outlasting structural change, and, among other instances adduced, was that of the now wingless Apteryx, which still, at rest, endeavours to tuck its head under its rudiment of wing. Professor A. H. Green exhibited and explained a model showing in action the manner in which the products of denudation are deposited in sedimentary strata. Dry sand, composed of grains of varied sizes, and clay were mixed together in a pan. This pan communicated by a sloping gutter with a long shallow pan filled with water. Upon the mixture water was poured from a rose to imitate the action of rain, and the mingled mud and sand, being carried down by the gutter into the trough, was seen after an interval to have sorted itself into deposits, in progressive order from the mouth of the trough, of coarse sand, finer grained sand, mixed sand and clay, and finally impalpable mud.

The professor showed how, by observation of the similar results of the natural processes of denudation and deposition in the geological field, tracing back from shale, through sand, to boulder formations, the old coast line of continents, with their estuaries, could be mapped out with considerable certainty, and how the limits of the shallow sea, in which grew the corals of the Headington beds (coralline oolite), could be traced by a somewhat similar process of reasoning. In Headington Quarry they had the limestone rock containing its corals very little injured, apparently *in situ* on the place where they actually grew. At Wheatley, a mile or two further on, they had the same formation, but with no corals entire, most of them absolutely comminuted, probably by the action of the breakers, showing that there was there the seaward edge of the ancient reef. Beyond, no trace of coral is found, but clay, the deposit of a sea deep enough to be undisturbed by breakers.—December 17th. The Rev. J. W. B. Bell in the chair. Professor A. H. Green delivered a lecture on "The Way in which Rocks have been Altered, Crushed, and Re-made by Pressure." Briefly noting the facts of the deposition, subsequent upheaval, and frequent contortion of the sedimentary rocks, the professor illustrated by specimens, diagrams, and lantern slides of microscopic sections, the resemblances and points of difference between a slab of slate and of clay-stone from a coal bed. The original elements of both were alike—sand and mud bands. The main differences were:—In the clay-stone, fracture along the plane of bedding; in the slate, increased hardness, folding of strata, fracture parallel to the axis of the fold = slaty cleavage. Pressure might have produced these effects. Microscopic sections showed uncleaved rock to consist of grains of all shapes and sizes, jumbled together without order. The cleaved rock consisted of similar particles, all more or less lenticular in shape, with their long sides parallel. An experiment illustrating this effect was shown, rough lumps of clay being squeezed together in a glass mould. The homely illustration of the manufacture of puff paste was then used to show the effect of pressure in producing flaking, *i.e.*, cleavage. After dwelling on the evidence afforded in the great mountain chains of the enormous force that has been brought to bear in crushing and grinding the rocks, the lecturer passed on to consider the geological puzzle of the formation of the crystalline schists. Comparing granite with gneiss, each composed entirely of crystals of quartz felspar and mica, he pointed out that the component crystals of the latter showed rude parallelism produced by lenticular forms. Noting the evidence, always present in crystalline schists, of tremendous crumpling, he considered the force which had produced this to have been likely to have had a good deal to do with making them what they were. The said force, with high temperature, was also declared able to bring about chemical changes; instanced by the decomposition of glass into silicate by water in a closed tube, exposed to pressure and heat. Crystals, too, found naturally in rock, could be produced artificially by these means. Evidence that crystalline schists have been formed by this process (dynamic metamorphosis) has been discovered in the Alps and elsewhere. A gradual passage can be traced from sandstone to schist, with evidence of the different stages. Broken fragments are seen to be crushed, then flattened and rolled out; then the softer ones are ground to powder as in a mill (milenite), and forced to flow in winding curves round the harder grains. This last produces eye-like appearances in the texture of the rock (German, *Augen Structur*). Then even this is finally ground down and obliterated. All the while chemical action has been going on, fresh minerals forming and arranging themselves in approximately parallel beds; and, as the result of all this, the original sandstone has now become a crystalline schist.

CONSTANCE C. W. NADEN.

In Memoriam.

The love of science, art, and song,
  Of all things good, and fair, and true,
Possessed her soul when she was young,
  And with the years still stronger grew.

She wisdom from the wise would learn,
  And gather all that books can teach ;
The heights for which the noblest yearn,
  She strove with earnest trust to reach.

With deepest truths she filled her mind ;
  With all the great and good have done,
Since first the races of mankind
  Left records of the victories won ;

How knowledge grew from more to more,
  Crowned by divine philosophy,
And Science adding to its store
  Of facts, could Nature's secrets see.

But those who most our lives control,
  Who cheer, enrich, exalt, inspire,
The masters of the heart and soul,
  The poets dowered with heavenly fire,

She in her heart of hearts enshrined,
  And kept for them her purest love,
The richest treasures of her mind,
  The songs which still the world can move.

And she with no unskilful hand
  Could call forth music from the lyre ;
The power of song at her command
  Could joys impart and hopes inspire.

Most promise-rich her youthful days,
  Her path of life a path of light,
To lead to still more sunny ways,
  And unto regions still more bright.

The bud had blossomed into flower,
  Of golden fruits the prophecy,
Of Autumn's blessing with their dower,
  And richest harvests yet to be.

But when our hopes had reached the height,
  So strongly based on victories won,
And all the future seemed so bright,
  A sudden cloud eclipsed the sun;

And darkness fell where erst was light:
  The spirit left her house of clay;
The young soul took its early flight,
  To where beyond the night is day.

And we in deepest grief lament
  The loss of one so young and true;
Her oil of life so quickly spent;
  So little done, so much to do.

Too young she passed. O mystery
  Of life and death! why is it so?
To ope that door we have no key:
  That such things are is all we know.

We think of all that might have been,
  Of all, in sooth, we hoped would be;
And now no more wilt thou be seen
  To help our lives. Ah, woe is me!

O gifted one, too early lost!
  Thy sunny grace, thy helpful power,
Most truly felt when needed most,
  I lay upon thy grave a flower:

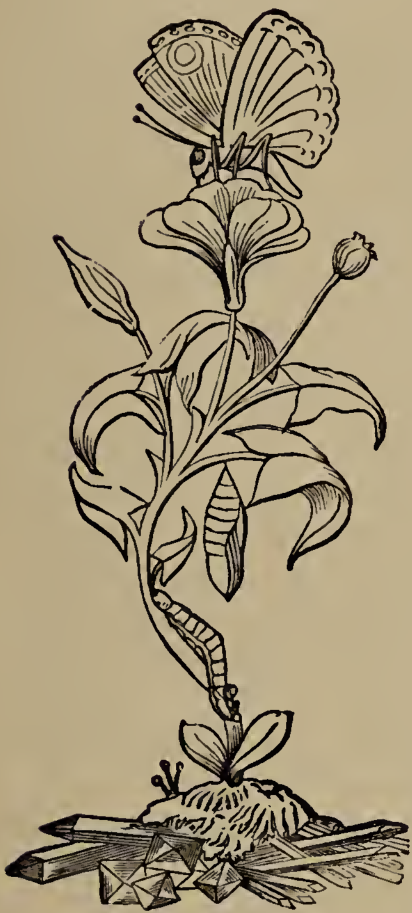
A flower that watered with our tears,
  That by some strangely mystic spell,
May whisper softly in thy ears,
  And tell the grief no words can tell.

J. A. LANGFORD.

Dec. 28th, 1889.

THE PRINCIPLES OF SOCIOLOGY.*

BY CONSTANCE C. W. NADEN.



Sociology is a branch of science which has yet to establish in the public mind its right to exist. It is perhaps natural that people should resent being treated as social units, and that they should not like to see their most cherished ideas accounted for on evolutional principles — those ideas which surely represent eternal truths, and which *ought* to be accepted by all sorts and conditions of men, quite irrespective of race, habitat, or stage of civilisation. The definition, "Sociology is the science of the growth and development of human societies," does indeed sound sufficiently inoffensive; but it is when we descend to details that human dignity feels itself assailed. "What!" we may imagine a Red Indian demanding of some new and heterodox medicine man—"what! do you actually mean to tell me that my great-great-grandfather was only a man like myself, when I know that he was a dog, and for this reason never harness a dog to my sledge. Do you mean to tell me that my father's ghost did not come to me last night in my sleep, when I saw him, and heard him—yes, and he beat me and gave me a bad pain in my side? Who should know that better than I? Why, I have the pain still! Worse than all, do you actually say that the sacred legends of our tribe arose in the first place from mere misunderstanding of facts or of words? That our laws, our customs, our religion, our very tribal existence grew up like a plant, and so may perish? When we know that these things were the work of the Gods and of our fathers? All this may doubtless be very true of the Iroquois, let us say, or of the Dacotahs—but it is sheer blasphemy to apply it to us Chippeways." I do not imagine that there are any among this audience who will sympathise with the poor Chippeway—yet,

*An address delivered before the Sociological Section of the Birmingham Natural History and Microscopical Society, on the occasion of the opening of the session, Tuesday, 22nd October, 1889.

after all, his indignation is neither unnatural nor unreasonable. For it is a Sociological axiom that no mind can by an effort of will transport itself from one evolutional stage to another stage more advanced and more complex. The principles of a science can never be intelligently accepted until its data are understood, fitted together, viewed from every side, and known in all their mutual bearings. If, without such knowledge, the principles are taken on trust, they change their character, and are transformed into dogmas, of no more avail for intellectual nutriment than the driest books of theology. Teach a savage—or a schoolboy—the whole contents of a chemical text book without giving him a glimpse of the facts summarised in its formulæ, and you might as well have taught him the Athanasian Creed or the magician's Abracadabra. I do not mean that he must necessarily see every process in the laboratory, but that he must have sufficient practical knowledge to form a clear conception of the phenomena from which the principles are inferred. Ill-gotten *truth* never prospers, but ceases to be truth in the mind which acquires it otherwise than by the legitimate method of rational inference. It is like the lightly earned fairy gold that changes to dead leaves at the dawn of day.

The bare idea of Sociological law could not possibly have arisen at an early period in the history of knowledge. Sociology demands the concurrence of all the sciences to furnish its raw materials, and to work out the lines on which it must proceed. All must combine in the bestowal of its birthright—as the Olympian gods were fabled to shower gifts upon some fortunate infant: endowed by Juno with power, by Venus with beauty, with wisdom by Pallas, with genius by Apollo. No conception of the formation and growth of societies can ever spring up until we have learnt to view the physical universe as a network of cause and effect, of action and reaction. Nor can the conception become fruitful until we can trace, with at least a partial comprehension of the processes involved, the evolution of organic life, thus honestly earning truths which can afterwards be applied to the interpretation of social phenomena. Further a knowledge of the laws and workings of the human mind is absolutely essential that we may analyse aright the strange customs, the wild traditions, the apparently senseless prohibitions and commands which we find among barbarous peoples—or which our own forefathers inherited from ancestors still more remote.

Even with these equipments, the result of our Sociological investigations must be, and perhaps must always remain, extremely imperfect. To a certain extent it must be granted

that the public distrust is justifiable. The science has indeed advanced beyond the stage of mere theoretical possibility; it does exist, but only in the embryonic condition, with all its details and even its general outlines as yet indistinct. There is a preliminary difficulty in the selection of its data, which of course renders its inferences questionable in geometrical ratio with the doubtfulness of their foundation. All this is fully admitted by Mr. Spencer in his chapter entitled "Primitive Ideas."*

"What ideas *are* primitive?" we ask—and the answer is, "We do not know." It must be remembered that our savage contemporaries are, in one sense, no more primitive than we are. They have an equally long ancestry, and there is no reason for assuming that the lowest of them have neither advanced nor retrograded since the dawn of humanity. "Probably," says Mr. Spencer, "most of them had ancestors in higher states; and among their beliefs remain some which were evolved during those higher states. . . . . It is possible, and I believe probable, that retrogression has been as frequent as progression." What is said of ideas may, of course, be said of customs, manners, and laws; so that our study of the evolution of mankind from primitive conditions is hindered by the difficulty—nay the impossibility—of determining by direct evidence what those primitive conditions were.

Another and less obvious hindrance comes from our incomplete knowledge of our own times. What are we ourselves, viewed as social units? Whither are we moving, and what is the curve of our line of progress? What is the goal towards which we are really working?—for it may be, and probably is, far other than that which we set before our imagination. Not possessing the solution of these enigmas, we cannot know the full sociological significance of our own day or of any previous day, since part of that significance lies in the unseen future. That future is without doubt as rigorously predetermined by past and present as the nature of the harvest is predetermined by the nature of the seed that is sown. If we really knew the crop, we could both predict the harvest and could trace its past history from the formation of the ovule to the liberation of the seed when mature. No child of the century can truly understand himself or his age, or can solve the problems in which he himself is a factor. If he could, he would be a child not of this century, but of all centuries. As our knowledge advances, and as our apprehension of principles becomes more definite

*Principles of Sociology, Vol. I., p. 93.

and coherent, we may learn to distinguish many of the "streams of tendency" which flow around us or bear us onward; but the inter-actions even of those which are seen are far too complex to be worked out by the clearest intellect. And we can never be certain that the most important currents have not remained unobserved, just because we are moving with their motion.

"Enough," cried Rasselas, when Imlac had explained to him the necessary qualifications of a poet—"enough! Thou hast convinced me that no human being can ever be a poet." In like manner, I have possibly suggested to some present that the existence of this Section and the delivery of this Address must be mere vanity, since no human being can ever hope to become a Sociologist, the earliest and the latest conditions of society being, for different reasons, wrapped in obscurity. Yet I would fain hope that my audience will be more indulgent than the Prince of Abyssinia, who, wearied out by his friend's rhapsody, refused to hear further particulars of the poet's vocation.

There is one consideration which should make every man a Sociologist. There is a key fitted to unlock many of the dark places into which direct inductive research can never penetrate. *Without* inductive research, the key is indeed useless—for we must take the trouble first to find the lock that it fits, and then to examine diligently the stores to which it gives access. And this key is that knowledge of the laws of human reason, and the workings of the human mind, of which I have already spoken, as absolutely essential to the sociological student. But I might, in one word, have called it self-knowledge. Though we cannot completely estimate the modifiable elements in ourselves and in society, because these elements are exactly the ones which unconsciously bear our conclusions; yet we can, if we will, learn to discover in our own personality the foundations of human thought and feeling, which do not change, and which are the same for the whole world. I do not mean that we are to evolve the condition of primitive society out of our own inner consciousness, but that we are to use that inner consciousness as an instrument of selection and interpretation. And with good right, for your reason and my reason are, fundamentally, one with the reason of the race;—of the most evolved sage and the most undeveloped savage. That is, natural logic is in all men the same; and this truth will often give us a clue to the origin of the most apparently irrational beliefs and practices. In Mr. Spencer's words—"Our postulate must be that primitive ideas are natural, and, under the circumstances in which

they occur, rational. In early life we have been taught that human nature is everywhere the same. Led thus to contemplate the beliefs of savages as beliefs entertained by minds like our own, we marvel at their strangeness, and ascribe perversity to those who hold them. This error we must replace by the truth that the laws of thought are everywhere the same, and that, given the data as known to him, the primitive man's inference is the reasonable inference."* If the savage had not been a reasoning being, he would have rested content with the apparent chaos around him. He would not have felt the necessity of inventing an invisible entity, a mysterious second self, a soul or spirit, to account for dream images, for waking visions, for shadows and reflections, for the phenomena of syncope, catalepsy, and death; nor would he have proceeded to explain by similar spiritual agencies the alternations of rain and sunshine, the fierce winds, the drought, the flood, the famine. Unconsciously he was seeking for a principle of order in the midst of confusion. The light that led him astray was yet the light of reason.

It is, of course, difficult to conceive the world as it must appear to one who is wholly ignorant of those physical truths which have become incorporated with our very perceptions. But the feat can in part be achieved by the analysis of our ideas to their simplest elements, and the laying aside of all that has been contributed by science and by philosophy. Then we may try to reconstruct the world from the simple data of sense-perception, rigorously putting aside all suggestions which are incompatible with the most childish ignorance.

In this way we may select from among the mental and social characteristics presented to us by the barbarous tribes of to-day, those which are likely to have belonged to the primitive man, and those which represent secondary and tertiary stages; and may be able to sketch out provisionally the mode of development from the former to the latter. This is not, it will be said, a very sure mode of interpretation—for, hard as it is to acquire knowledge, it is still more hard to divest one's self of it at will, and the second nature of civilisation and education, even if expelled with a pitchfork, will steal back again surreptitiously and vitiate all our conclusions. The house may be swept and garnished, but the old demon of Philosophy will find his way back again, bringing with him seven companions worse than himself, in the shape of Sociology, Comparative Mythology, and other nameless phantoms.

* Principles of Sociology, Vol. I., p. 98.

In this objection there is some force—but its force is almost wholly neutralised by the consideration that we are allowed to use our organ only as throwing light upon modes of thought and life which actually exist or which can be proved to have existed. If we proceeded farther, and took our own reconstruction of the world (in thought) as representing an actual construction by primitive man, we should grossly err, and put ourselves at once outside the boundaries of science. It is by the *comparison* of our ideal primitive man with the real savage that we may hope to arrive at sound conclusions. From the savage we may learn that many things which we thought primitive are really acquired ; by our inner touchstone we may distinguish the real nucleus of his character and his ideas from the growths which have overlaid and almost hidden it. His sophistications are unlike our sophistications, and the two brought into contact will neutralise each other, and will thus rectify the two sets of errors which threatened to destroy our science at its very birth.

We have, then, to study (1) humanity in its barest elements, (2) its varying environments, and (3) to trace, by inductive research and deductive reasoning, the gradual development of humanity by its own inner forces, and by stimulus from without.

The bare elements of humanity prove not only man's capacity for the social state, but, so to speak, his innate sociality. For when we look at these elements we find that they are distinctively social just so far as they are distinctively human. Every individual man *implies* or *presupposes* society by the very foundations of his being. It is a truism to say that there could be no society were there no individuals, and that, as the individuals are, the society must be. But it is equally true, if not yet a truism, to say that there could be no really *human* individuals were there no society, and that man is literally unthinkable except as a social creature. Just consider what we should have to strip away from our conception of the human character if we tried to imagine a man perfectly isolated from his kind, both in retrospect and prospect—not only living apart from human society, like Alexander Selkirk, but never having known it at all—utterly alone, and made for solitude.

In the first place we must strip away every emotion except brute fear, brute rage, and brute pleasure in food and warmth. All the higher emotions—all the emotions distinctively human—refer directly or indirectly to the fellow-creatures with whom we have intercourse. Affection, sympathy, pride,

love of approbation--all the higher forms of hope and of joy, of sorrow, and of despair—all these cannot exist apart from human relationships. Growing by exercise, they crave the establishment and extension of such relationships as a vital necessity.

In the second place, we must strip away all the better part of the intellectual life. The germs of perception and memory may perhaps remain; but none of those defined concepts, those more or less coherent trains of reasoning which grow from the necessity of making thought intelligible to self, that it may be intelligible to others. To a being unique of his kind, the world could be only a limited storehouse for individual wants—not an illimitable cosmos interpreted by racial experience.

It hardly needs to be said that in the third place we must strip away the entire moral character. Morality consists of duty to others and duty to self, which two are in the last analysis one. But without a certain amount of intellectual development no idea of duty or principle of any kind could arise, so that even the self-regarding virtues could never originate. And the golden rule, "Do unto others as you would that they should do unto you," which is found in various forms in all religions, and which lies at the root of justice and mercy alike, would of course be meaningless. The ground of morality is on the intellectual side, the knowledge that we are surrounded by beings like ourselves; and on its practical side the intuitive sense that equals should be treated equally.

The emotions, then, the intellect, and the moral nature of man all *pre-suppose* society, and apart from some form of society cannot be thought of even as existing, any more than society would be possible without their existence. It may very well be urged that the family would yield a certain scope for their exercise, and that we might all have remained in the condition of the "solitary families of the Wood-Veddahs," mentioned by Mr. Spencer, which do not aggregate into communities; or even of the wild men in the interior of Borneo, who form transitory connections lasting only till the children are old enough to shift for themselves, and otherwise live in savage independence. But these are obviously cases of arrested racial development, or more probably of retrogression, in which the mind and character are permanently fixed at a low level; and they can no more be taken as typifying the normal tendencies of humanity than the microcephalous idiot can be taken as typifying the normal structure of the human mind. As the thinking faculties of the primi-

tive man develop, the desire for intercourse with his fellow-creatures, as well as the need of mutual aid, must be increasingly felt, and his practical reason must take shape in a rudimentary morality. The emotions are brought into play, and act and re-act with the social environment, so that character on the one hand, and society on the other, are progressively modified.

(*To be continued.*)

THE LONDON MEETINGS OF THE CONGRÈS GÉOLOGIQUE INTERNATIONAL,

SEPTEMBER 17TH TO 29TH, 1888.

BY REV. G. DEANE, D.SC., B.A., F.G.S.*

It may be interesting at the outset to give some idea of the personnel of the gathering. The roll of members of the Congrès, revised and corrected to Wednesday, the 19th September, includes 835 names from all the civilized countries of the world. Of these 407 were present in London, 256 being from the British Isles, and 151 from other countries. Germany contributed 29, Austria-Hungary 10, Belgium 16, Canada 4, Spain 4, United States 16, France 18, Italy 11, Russia 13, Switzerland 5, Sweden 4 ; even Roumania sent 3, and other countries lesser numbers. I give these details to show the widespread organization of the Congress, and the interest taken in it by geologists of all nations. In all twenty-six countries are represented on its roll.

With representatives speaking such diverse languages, it is clear that some common language must be used as the vehicle of communication, and for this purpose French has been chosen in the meetings as likely to be intelligible to the greatest number. I cannot say that the result impresses me with the possibility of efficient public discussion of abstruse points by accomplished specialists of different nationalities. But notwithstanding this, *litera scripta manet* —the written record remains ; and remains not only for the use of those who were present, but also for the use of all interested in the subjects throughout the world.

The meetings were held in the rooms of the University of London, in Burlington Gardens. For myself, there was something grotesque in seeing the halls, wherein twenty

*A paper read at the Meeting of the Geological Section of the Philosophical Society of Birmingham, on 22nd November, 1888.

years ago I had miserably, though successfully, endured examination, converted into a geological museum and a refreshment room. To occupy almost the identical seat in the theatre of the University which I filled when presented to the Chancellor in 1870 on the occasion of the opening of the University buildings by Her Majesty the Queen roused happier memories. And to be sitting side by side in friendly converse with the grim examiners of those early days increased for me personally the oddness of the situation. However the rooms were well adapted to their new purpose; and thanks were due, and were heartily rendered, to the Senate of the University for permitting their use.

Those who are familiar with the procedure of the British Association, the Social Science Congress, and similar gatherings will not need to be informed that the first step of a member on arrival is to give in his name and address, get his ticket of membership, and obtain whatever literature there may be for distribution. On the present occasion this literature was voluminous. There was not only the inevitable list of members and programmes of meetings, excursions, and other matters, but also the catalogue of the exhibition, the printed reports of the various committees that have been at work since the last meeting at Berlin in 1885, a series of papers from various authors on the crystalline schists, a carefully drawn up and elaborate account of the excursions to be undertaken in the following week, and sundry other papers and pamphlets of interest. Also on this occasion each member was presented with a small bronze medal, slightly less in diameter than our halfpenny, having on one face two hammers with their handles crossed and the legend "*Mente et malleo*," and on the other the inscription "*IV. Geologorum Conventus Londin.*, 1888." It struck me this was rather a good idea in a gathering of such various nations, as enabling us readily to recognise a friend or comrade amidst the confused tumult of the London streets. As I wore mine rather conspicuously on my watch chain, I found myself occasionally accosted by someone similarly adorned, and was thus enabled to render to some of our foreign guests the courtesies of civilized life, and to give them in some cases information they were seeking. I noticed, however, that many members did not wear their medals, but kept them, I suppose, to show to their grandchildren when they got home.

Now I come to the meetings themselves. The Congress assembled on Monday, the 17th of September, and the meetings lasted through the ensuing week. In the following week a series of excursions all over England and Wales was

planned. And there was a very interesting and valuable collection of geological exhibits in the library of the University.

I will treat briefly of :—

1st. The President's Address and the meetings for discussion ;

2nd. The afternoon visits to places of interest, and the evening receptions ;

3rd. The Geological Exhibition ; and

4th. Offer a few remarks on the advantages of the Congress, and its future work.

I. After sundry preliminaries, under the chairmanship of the late President, Professor Beyrich, of Berlin, the new "Bureau du Congrès" was elected, and the new President, Professor Prestwich, of Oxford, took the chair. His address was delivered fluently in French ; and, although I fear his voice scarcely filled the rather spacious theatre, was listened to with marked attention. This address recounted the past history of the Congress, gathered up the results of past labours, and offered some judicious remarks on the questions and subjects set down for present consideration and discussion. At its close, the vote of thanks was proposed by Dr. Sterry Hunt, of Montreal, and seconded by Professor von Zittel, of Munich, who raised a genial laugh by referring to Professor Prestwich as "the Nestor of English geologists;" and the members separated to attend the reception of Professor and Mrs. Prestwich.

The sitting of Tuesday, 18th September, was occupied by a discussion upon nomenclature ; Professor Capellini, rector of the University of Bologna, one of the vice-presidents, in the chair. At the outset, one of the crucial difficulties of an international congress became apparent. Dr. Hicks wished to speak in English, and, after a little parley, the Chairman permitted this and appointed one of the Secretaries, M. Barrois, to act as interpreter into French. Dr. Hicks supported the well-known view of our President, and Dr. Lapworth himself spoke, explaining his position. Dr. Sterry Hunt, of Montreal, spoke also substantially on the same side. There was, however, considerable diversity of opinion, although all agreed that the three divisions corresponded to the three faunas of M. Barrande, of Prague. Dr. Archibald Geikie and Professor Hull objected to change the name "Lower Silurian" because it not only had priority, but also was associated with the work of Murchison. Professor Torell, of Stockholm, advocated the retention of the terms "Lower" and "Upper Silurian," rejecting the new term of

"Ordovician." Professor Gosselet, of Lille, accepted the correspondence of the three English terms to the three faunas of Barrande; but rejected the terms "protozoic" and "deutozoic" on account of the enormous development of the Devonian strata in the Ardennes, and in this view he was supported by Professor Dewalque, of Liége. Mr. Walcott, of Washington, gave the American divisions; and Colonel Delgado, of Lisbon, those of Portugal. Mr. Walcott, who is the Palæontologist of the U. S. Survey, made a most important admission which brings the American classification of the Cambrian rocks into full accord with that of Sweden and of Europe. The Olenellus fauna is Lower Cambrian; the Paradoxides, Middle Cambrian; and the Olenus, Upper Cambrian (see *Nature*, for October 4th, p. 551). Professor J. F. Blake maintained the existence of a fourth fauna (Olenellus) and wished to introduce his term "Monian" for a new system of rocks in Anglesey and Ireland. Professor de Lapparent, of Paris, maintained that before deciding anything, the base of the Cambrian ought to be definitely settled, and advocated its extension to the limit of the crystalline schists. In this he was practically supported by Professor Barrois, of Lille. Professor Gilbert, of Washington, advocated delay because questions of limits are local; the whole world is not yet explored, and the future may modify our ideas. Mr. Marr, of Cambridge, in the absence of Professor Hughes, rejected stratigraphical limits in favour of palæontological, recognised the universality of the three faunas, and proposed to group the three stages under the name Barrandien. The Chairman (Signor Capellini) concluded that the threefold division clearly had most acceptance in the meeting; but in default of general assent, he judged it best to suspend the vote.

From this discussion it is perfectly clear not only that the three grand divisions are universal, but also that for English geology the term "Ordovician" will replace "Lower Silurian," and that the English speaking peoples will adopt it. Those who pin their faith to Murchison forget the equally valuable work of Sedgwick and his term "Upper Cambrian." Whether the foreign geologists will adopt the British name remains to been seen. MM. de Lapparent and Barrois seemed in favour of two divisions, each subdivided into two—"Silurian" in two divisions, upper and lower; and "Cambrian" in two divisions, upper and lower, the latter consisting of the underlying azoic crystalline schists. This, as a pure matter of classification, might be simpler. But for my part I believe that Ordovician will ultimately be universally adopted; and I

do not think that the huge Devonian development of the Continent is any argument whatever against the adoption of the terms Proterozoic and Deuterozoic or their equivalents. My only objection to the use of those terms is that, whatever may be said about the Monian system of Professor Blake, future researches *may* disclose an earlier fauna in Pre-Cambrian rocks, and in such case the base of the Proterozoic would have to be carried lower.

I have given this discussion so fully for two reasons—one, that it bears so closely on the work of our President, Dr. Lapworth; and the other as showing the influential character of the speakers, and the representative nature of the Congress.

But I must be shorter with the other discussions, or I shall sorely weary you, and also have no space left for other matters, which in their way are quite as important and perhaps more interesting. I will, therefore, for the remaining sittings deal with the subjects rather than the particular speakers.

Another point in connection with classification and nomenclature occupied the sitting of Thursday, the 20th September, and centred in the question whether the term "Quaternary" should be used as applied to an era distinct from "Tertiary," and, if used, where should be the limit between the Tertiary and Quaternary. It was generally felt that, notwithstanding the insignificant thickness of the Quaternary strata, the advent of man and the existing mammals was sufficient to render this era (époque) absolutely distinct from the Tertiary. Professor Prestwich advocated the "Forest-bed" as the base of the Quaternary in England.

This Committee or Commission on Nomenclature and Classification, which was appointed at the Bologna meeting in 1881, in addition to the reports of the British and American Sub-Committees, presented through its secretary, M. Dewalque, a very valuable report, which is likely to be the basis of international geology for many years to come. The Commission's work is, in the main, ended; but it was re-appointed, with somewhat extended powers, to report to the next Congress at Philadelphia in 1891.

The other Commission appointed at Bologna related to the Map of Europe; and its report was presented by Dr. W. Hauchecorne, of Berlin. Some parts of Central Europe will be ready for publication during the next two years. The scale adopted is 1 : 1,500,000 (*i.e.*, 1 inch = 23·67$\dot{3}$ miles); and the map will consist of forty-nine sheets. The colours are somewhat different from those we are accustomed to in England, but it will be a great advantage to have uniformity of colouring for all European countries.

(To be continued.

SOME NOTES UPON A PROPOSED PHOTOGRAPHIC SURVEY OF WARWICKSHIRE.

BY W. JEROME HARRISON, F.G.S.,

VICE-PRESIDENT OF THE BIRMINGHAM PHOTOGRAPHIC SOCIETY; AUTHOR OF THE "HISTORY OF PHOTOGRAPHY;" "PHOTOGRAPHY FOR ALL," ETC.

(Continued from page 14.)

SAXON WARWICKSHIRE.—The Romans were little more than visitors to Warwickshire, and they probably seldom, if ever, penetrated the recesses of Arden. After their departure in 449 A.D., they were succeeded by the Saxons, who "came to stay." And yet the Saxons cannot be said, in the ordinary sense of the term, to have "conquered" the Midlands. The tribes of Angles (from North Germany), who landed on our eastern coasts, very slowly advanced inland, and only by slow degrees gained power over, and amalgamated with—rather than subdued—the Celtic inhabitants of Arden.

Warwickshire formed a part of the Saxon Kingdom of Mercia, which flourished under Cridda, Ethelbald, and Offa from the sixth to the ninth centuries; after which the eight Saxon sub-kingdoms (the Heptarchy) united to form the Anglo-Saxon Kingdom (827-1066).

Many of the tumuli or mounds of earth (sometimes so large as to be actually small hills) which stud the surface of Warwickshire, contain the remains of Saxon chiefs; but without actual exploration we cannot distinguish the Saxon from the Celtic tumuli. At Walton, near Wellesbourne, a Saxon grave, which was opened in 1774, contained "three skulls lying in a row, with two Saxon jewels set in gold, one with an opal and two rubies, and the other adorned on both sides with a cross, between two rude human figures, with a sword or lance at the outer hand of each." Iron swords and the iron bosses of shields are also commonly found in Saxon interments; while stone implements, etc., accompany the bones of the Celts.

It is probable that during the next few years many of the as yet undisturbed tumuli will be explored; and it is earnestly to be hoped that photographs will be taken, recording each stage of the operations, and especially as showing the positions of the interred skeletons, whether lying on the side or back, and with legs drawn up or extended, as each of these points appears to have characterised different times and different nations.

Of undoubted Saxon remains we can only point to two places in Warwickshire. The first of these is at Tamworth Castle, just within the north-eastern boundary of the county, where the "herring-bone work" in the base of the lower wall is very characteristic. The second example is at Wootton-Wawen, where the lower half of the church tower is certainly of Saxon masonry. In each of these cases we want photographs taken from a moderate distance, showing the entire building, etc., and also several near views in which each stone would be distinctly represented. The best evidence of the complete colonisation of Warwickshire by the Saxons, consists in the numerous Saxon place-names which still remain. The names of the rivers and hills—as Arden, Avon, Rea, etc. —are certainly Celtic, but most of the towns and villages have the truly Saxon affixes of "ham," "ton," "ley," "thorpe," etc. It is now pretty well acknowledged that the name of our new city—Birmingham—represents the dwelling-place *(ham)* of the tribe or descendants *(ing)* of Beorm; the said Beorm or Biorn being a Saxon chieftain.

The Danes, who ravaged the east and south of England so unmercifully in the ninth and tenth centuries, are thought not to have advanced beyond Rugby, the termination *by* being distinctively Danish. The gigantic ruddy animal which (carved out in the turf) ornaments the "Vale of Red Horse," near Kineton, in the south-east of the county, may be either of Saxon or of Celtic age; although there is a legend which assigns it to Neville, Earl of Warwick, in the fifteenth century. Neville may perhaps have "scoured"* it.

In the same direction, and just on the county boundary, are the famous Rollright Stones, some of which are seven feet in height. They resemble somewhat the famous stone circles (Druidical) of Stonehenge and Avebury, and are more probably of Celtic rather than of Saxon times.

The famous legend of Lady Godiva belongs to the very close of the Saxon period. Godiva (properly Godgiva) was the wife of Leofric, a powerful Saxon noble who died in 1057. He and his wife richly endowed a monastery and church at Coventry; and Dugdale records that in a stained-glass window in Trinity Church, Coventry, the stout earl and his fair wife are depicted, the former bearing in his hand a scroll with the inscription :—

"I Luriche for the love of thee
Doe make Coventre Tol-free."

* See that capital book, "The Scouring of the White Horse," by Tom Hughes, in which he describes a similar work in Berkshire.

As in Leofric's time the population of Coventry was only 350, while the houses were but one storey high, with a door and *no windows*, the legend of "Peeping Tom" is in the highest degree incredible. As a fact, the tale probably originated during the latter part of the seventeenth century. Possibly some future historian will find in "Peeping Tom" the prototype of the man who carries a detective camera.

Many Saxon laws and customs have survived down to our own times; and to the Saxon rulers, in fact, we owe the very outlining of our county, as indicated by the word "shire." They divided the "shire" into large divisions called "hundreds," and in Warwickshire we have:—

I.—Hundred of Hemlingford, including Birmingham, Solihull, Atherstone, Tamworth, etc.

II.—Hundred of Barlichway, including Alcester, Stratford, Henley-in-Arden, etc.

III.—Hundred of Kington (or Kineton), including Warwick and the south-east of the county.

IV.—Hundred of Knightlow, including Kenilworth, Rugby, Southam, etc.

V.—Coventry, with a district around it, known as the "County of Coventry."

It is possible that these "Hundreds" may form convenient sub-divisions for the purposes of our photographic survey; in which case the Birmingham Photographic Society would naturally commence with the Hundred of Hemlingford, whose area is about one-fourth (say 220 square miles) of that of the entire county. It is somewhat unfortunate that our city of Birmingham should be situated on the extreme north-west margin of the county; but the "county," as a unit, is so much superior to any other that it must, perforce, be adopted.

MEDIÆVAL WARWICKSHIRE.—With the conquest of England by the Normans, in 1066, the written history of Warwickshire may practically be said to commence. In the Domesday Book we have a survey of the county, which includes the names of all the possessors of land, with the area and value of their possessions. With the Normans, too, we get the first important building operations—they erected many churches and castles.

The monuments of the mediæval age (which extended from the eighth to the fifteenth centuries) include the most striking buildings in Warwickshire. The great castles of Warwick and of Kenilworth were, until the invention of

gunpowder, practically impregnable fortresses; while Maxtoke Castle, if smaller, is even more interesting, for its "moat and outer walls, and its old iron-bound gate and gatehouse are scarcely changed during six hundred years." Astley Castle, near Nuneaton, dates from the thirteenth century, when a castle was a fortified house with a moat. Tamworth Castle we have already mentioned.

The close of the mediæval period saw also the destruction of the monasteries and other religious houses by Henry VIII. (1539); but Maxtoke Priory, Polesworth Nunnery (near Tamworth), Merevale Abbey (near Atherstone), the Whitefriars Monastery at Coventry, etc., still remain (in a more or less delightfully ruinous and picturesque condition) to testify to the religious zeal of our ancestors.

And the old churches: how delightful they are! Shall it not be our pleasure to record their every detail and architectural feature? so that when the hand of the "restorer" is laid upon them there shall be evidence retained of their original structure and condition. To take but two cases. "As an example of a preceptory and church of the twelfth century, of which neither restoration nor neglect have changed any important feature, Temple Balsall is unrivalled in Warwickshire, and not surpassed in any part of England." Let the Beauchamp Chapel (1465) in St. Mary's Church, Warwick, be our second example. It is, without doubt, as a sepulchral chamber, "one of the most famous in the kingdom," containing among others the tomb of Richard Beauchamp, Earl of Warwick, the cost of which alone exceeded £40,000 of our money.

Of moated houses, and picturesque old mansions, Warwickshire has many. Compton Wynyates (1510) is described by Mr. Timmins as "a marvellous and harmonious combination of the best and most artistic work in brick, stone, and wood. Its variegated colours of bricks, its richly-moulded brick chimneys, its exquisitely carved gables and beams and wainscoting, its bold and vigorous and delicate stone carving, its noble rooms and great hall, with minstrels' gallery, its ninety rooms, with a secret chapel in the roof, its long lines of dormitories for soldiers, its venerable moss-covered and picturesque quadrangle, combine a series of charming views which are unequalled in Warwickshire and unsurpassed elsewhere."

Of slightly earlier date is the old fortified manor house of Baddesley Clinton—"charmingly picturesque, for it has a fine ancient moat surrounding its gray walls, and quaint gables and chimneys, and its pretty garden parterres surrounded on three sides by the rooms of the house."

Guy's Cliffe, two miles north of Warwick, is pleasingly described in Camden's "Britannia," written in 1586:—"Hard by the River Avon standeth *Guy Cliff*, the very seat itself of pleasantnesse. There have ye a shady little wood, cleere and cristall springs, mossy bottomes and caves, medowes alwaies fresh and green, the river rumbling here and there among the stones with his streame making a milde noise and gentle whispering; and, besides all this, solitary and still quietnesse, things most gratefull to the Muses. Heere, as the report goes, that valiant knight and noble worthy, Sir Guy of Warwicke—so much celebrated after he had born the brunt of sundry troubles and atchieved many painful exploits—built a chapell, led an eremit's life, and in the end was buried. Howbeit, wiser men doe think that the place took that name of later time by far, from Guy Beauchamp, Earle of Warwicke; and certain it is, that Richard Beauchamp, Earle of Warwicke, built St. Margaret's Chapell heere, and erected a mighty and giant-like Statue of Stone, resembling the said Guy."

WARWICKSHIRE IN LATER TIMES.—During the sixteenth century many most interesting buildings were erected in Warwickshire, including Pooley Hall, near Tamworth; Weston Park, Shipston-on-Stour; Wormleighton; the Leycester Hospital, at Warwick, &c. Aston Hall (1618) is a fine Elizabethan mansion standing in a northern suburb of Birmingham, and now the property of the corporation.

At the opening of the seventeenth century we find a Warwickshire man—Robert Catesby—acting as the proposer of the "Gunpowder Plot;" and quite lately it has been shown that the famous—or infamous—Guy Fawkes himself hailed from our county. Catesby was born at Bushwood Hall, Lapworth, and it is believed that the details of the plot were arranged there and at Norbrook, Clopton (near Stratford), and Coughton (the seat of the old Roman Catholic family of the Throckmortons). The Princess Elizabeth was then residing at Combe Abbey, near Coventry; and the local conspirators arranged a hunting match at Dunsmore, near Dunchurch, for the 5th of November, intending, as soon as they heard of the success of the Plot, to carry off the Princess and proclaim her Queen of England. When the news of the arrest of Guido Fawkes arrived, the conspirators fled into Staffordshire, where they were pursued and captured at Holbeach, Catesby being shot dead in the attack.

THE CIVIL WAR IN WARWICKSHIRE.—The first battle between the Royal and the Parliamentary forces was fought in 1642, on the plain below Edgehill, near Kineton, in the

south-east of Warwickshire. The scene remains almost unchanged; and with the assistance of a few lantern slides (especially if our friend Mr. Jaques would supply moveable bodies of troops for the occasion), the eventful struggle of that day could be pictorially reproduced in a most graphic manner. This would be a novel and interesting way of teaching history.

WARWICKSHIRE WORTHIES.—To illustrate the local incidents connected with the lives of famous men and women who have been born in Warwickshire will be a pleasant task for the camera-carrier. The plain farm-house in Arbury Park, near Nuneaton, acquires a halo when we know it as the birthplace of "George Eliot;" and all the country round is described in her various novels as accurately as in a guide-book. We shall associate the great antiquary—Dugdale, Garter King-at-Arms—with his home at Coleshill; David Cox with the Birmingham suburb of Harborne; Bishop Vesey with Sutton Coldfield; Dr. Priestley (the discoverer of oxygen) with the Birmingham suburb of Sparkbrook; Dr. Arnold and Rugby School; Matthew Boulton (who sold "what all the world desired—*power*") with Birmingham; Michael Drayton (the poet) with Hartshill; and many another famous name shall add interest to our work. But, far above all, we possess in Stratford-on-Avon and the neighbouring country such an illustration of the life and work of the immortal Shakespeare that this alone would be sufficient to render Warwickshire one of the most interesting spots of the whole world in the eyes of all civilised nations! When the first Shakespeare jubilee was held at Stratford in 1768, the most popular song was that written by Garrick, in which the main feature is the connection of the bard with the county:—

"Ye Warwickshire lads and ye lasses,
See what at our jubilee passes;
Come revel away, rejoice, and be glad,
For the lad of all lads was a Warwickshire lad,
Warwickshire lad,
All be glad,
For the lad of all lads was a Warwickshire lad."

THE WARWICKSHIRE OF TO-DAY.—And, lastly, we come to our own times. It is clearly our duty to secure, so far as in us lies, a faithful representation of the state of things as it is to-day. For every year we are "making history," and such a record will be just as much prized by posterity, as we should ourselves prize it did it exist for the past. Just think what

would be the value of good photographs of Bacon and of Shakespeare ; or of Queen Elizabeth and her minister Cecil. Looking forward into the centuries, we can discern a time when no less value will be assigned to Mrs. Cameron's grand photographs of such men as Herschel and Tennyson ; with those by other workers of our good Queen Victoria, and her "men of mind," Salisbury and Gladstone !

We must accumulate portraits, then, of all our local worthies. And to them we must add street scenes—secured with the hand-camera—from all our towns ; delineations of the avocations of the people must also be obtained—from the country labourer in his smock-frock (a garment now rapidly disappearing) to the skilled artisan of the city, seated before his lathe. Nothing that illustrates contemporary life must be omitted—the policeman, the soldier, and the volunteer must adorn our albums; and we must go "slumming" to depict the shady side of life.

Most congenial will be the task of recording the cottage and village scenery of Warwickshire. I have travelled round the world, I have spent many holidays in various parts of the British Isles ; and I can assert, without fear of contradiction, that for characteristic pictures of rural and home life our county is unequalled. Take the string of Shakespearean villages along the Avon, for example :—

> "Piping Pebworth, dancing Marston,
> Haunted Hillborough, hungry Grafton,
> Dadgeing Exhall, Papist Wixford,
> Beggarly Broom, and drunken Bidford."

Let anyone who loves English scenery drive (with his camera under the box-seat) from Warwick, through Charlecote (the home of the Lucys), to Stratford ; and thence on to Evesham and Tewkesbury, calling at the villages named in the above *quatrain* (said to have been penned by Shakespeare) *en route.* Let him not hurry—take a fine week in, say, June—and I will answer for it that he will ever afterwards mark that excursion with the whitest of white stones.

In writing this brief account of our county I must acknowledge my indebtedness to Mr. Sam Timmins's recently published "History of Warwickshire;" but I have also studied most of the original authorities from Dugdale to Halliwell. Our noble Free Reference Library contains practically everything that has been published on Warwickshire ; and some useful county books are also to be found in the Old Library.

If we are to "survey" Warwickshire in earnest, we must become students as well as photographers (and to my mind this will be one great good resulting from the task); we shall have to think of something else besides the beautiful and the picturesque; and we must remember that its associations may dignify the meanest dwelling, and render of world-wide interest the most prosaic surroundings.

(To be continued.)

Review.

The Flora of Switzerland, for the use of Tourists and Field Botanists. By A. GREMLI. Translated from the fifth edition by LEONARD W. PAITSON. London: Nutt, 8vo, pp. xxiv., 454. Price 7s. 6d.

BRITISH botanists are deeply indebted to Mr. Paitson for his excellent translation of this truly valuable work. This was first published in 1874, and since that time has passed through four (German) editions, and had a sale of over 6,000 volumes. Besides this there has been a translation into French, so that if circulation be a criterion of appreciation, the work must have been truly valued.

The work consists of I., a preface, containing valuable explanatory matter and information to specialists as to the best works bearing on their special studies. This is followed by an introduction, in which is given directions as to "Use of Tables," "Scale of Measurement," "Abbreviations," "The Classes of the Linnean System," "Summary of the Principal Divisions of the Natural System," and a "Tabular View of the Natural Families."

This is followed by II., "Table for Determining the Genus," the twenty-four classes of the Linnean system being adopted as the basis of this determination. Then follows III., "Tables for Determining Species," in which the analytical method is adopted. This part forms the flora proper; gives descriptions of 2,637 species and several varieties, and occupies 385 pages. The more critical genera, such as Rubus, Rosa, Hieracium, Salix, Potamogeton, are fully and ably discussed; and the geographical distribution of each species is given. But helpful as is this work, it is by no means a royal road to the determination of plants. To use it with advantage will require close attention to even minor points, but its careful use will be an education in botanical analysis.

The work closes with a "List of those species which are indicated in various works as growing in Switzerland, which are not now to be found or are very doubtful," "Frontier Plants," "Adventitious Plants," and an index to genera and common names.

Beside the descriptions of the species there are scattered through the text numerous notes which are both helpful and interesting. The printing is good, the size convenient for the pocket, and the book should command a large sale. J. E. BAGNALL.

Wayside Notes.

THE ROYAL SOCIETY.—The following are the Officers for the present year:—President, Sir George Gabriel Stokes, M.A., D.C.L., LL.D.; Treasurer, John Evans, D.C.L., LL.D.; Secretaries, Professor Michael Foster, M.A., M.D., Lord Rayleigh, M.A., D.C.L.; Foreign Secretary, Archibald Geikie, LL.D.; other members of the Council, Professor Henry Edward Armstrong, Ph.D., Professor William Edward Ayrton, Charles Baron Clarke, M.A., Professor W. Boyd Dawkins, M.A., Edward Emanuel Klein, M.D., Professor E. Ray Lankester, M.A., Hugo Müller, Ph.D., Professor Alfred Newton, M.A., Captain Andrew Noble, C.B., the Rev. Stephen Joseph Perry, D.Sc., Sir Henry E. Roscoe, D.C.L., Edward John Routh, D.Sc., William Scovell Savory, Professor Joseph John Thomson, M.A., Professor Alexander William Williamson, LL.D., and Sir Charles William Wilson, Col.R.E.

GEOLOGICAL SOCIETY.—Mr. W. J. Harrison, F.G.S., for many years co-editor of this magazine, has just received intimation from the secretary of the Geological Society that the Council have awarded him the proceeds of the "Barlow-Jameson Fund," in recognition of his "valuable contributions to geological science;" and he is invited to attend the anniversary meeting of the Society on the 21st of February, to receive the award. The Geological Society have paid a great and well-deserved compliment to Mr. Harrison in selecting him for this honour, and we offer him our heartiest congratulations. It may be interesting to note that the former recipients of the "Barlow-Jameson Fund" were—in 1882, Dr. James Croll; 1884, Baron von Ettingshausen; 1886, Professor Leo Lesquereux; and in 1888, Dr. Johnston-Lavis. The income of the fund is "to be applied every two or three years, as may be approved by the Council, to or for the advancement of Geological Science."

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—SOCIOLOGICAL SECTION. November 14th. Mr. W. R. Hughes, F.L.S., President of the Section, in the chair. Mr. F. J. Cullis delivered his exposition of the first three chapters of Mr. Herbert Spencer's "Principles of Sociology," and to Mr. Spencer's division of Evolution into three kinds, viz., inorganic, organic, and super-organic, contended for a further division into cosmic and psychic.—November 26th. Mr. W. R. Hughes, F.L.S., in the chair. Dr. Showell Rogers delivered an able and interesting paper on "Robert Burton, author of the 'Anatomy of Melancholy,'" to an appreciative audience.—November 28th. Mr. W. R. Hughes, F.L.S., in the chair. Mr. A. Browett continued the exposition of Mr. Herbert Spencer's "Principles of Sociology," taking the IV., V., and VI. Chapters on "Original Internal Factors" and "The Primitive Man—Physical and Emotional," and deduced from the known characteristics of modern savages the probable physical and emotional traits of primitive man.—December 19th. Mr. W. R. Hughes, F.L.S., in the chair. Mr. Kineton Parkes read a paper on Chapter VII. of Mr. Herbert Spencer's "Principles of Sociology,"

treating on "Primitive Man — Intellectual."—Geological Section Meeting, December 17th. Mr. T. H. Waller, B.A., B.Sc., in the chair. A circular from the British Association on "Geological Photography" was read by the chairman. A paper was read on "Grey Wethers and other objects of interest met with on a recent holiday tour," by Mr. W. R. Hughes.—January 21st. Mr. T. H. Waller, B.A., B.Sc., in the chair. The chairman announced the appearance of a new periodical for scientific and unscientific readers, "The Field Club." Mr. T. H. Waller, B.A., B.Sc., and Mr. John Udall, F.G.S., were unanimously re-elected as president and secretary respectively. Mr. C. J. Watson read a paper on "The Magnesian Limestones of Durham." Photographs illustrating the paper were projected on the screen by the oxyhydrogen lantern by Mr. Chas. Pumphrey. Other photographs, taken by Mr. C. J. Watson at the British Association meeting, were shown. They included views of York, Durham, Newcastle, &c.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—December 9th. Mr. Cardwell read a paper on "Domestic Bird Life," in which he mentioned a number of birds he had kept in confinement, and the many interesting points he had observed in their modes of pairing, nest-building, feeding, and treatment of their young, and related several anecdotes of the vagaries developed in individual specimens in his aviary. Although it is said the pigeon will not hatch out eggs other than its own, the writer noticed that they will usually hatch the eggs of other individuals. Parent birds, he was convinced, paid special attention to feeding the young of their own sex. He was of opinion that young birds did not break the shell by repeated blows, but by scraping it with the sharp point of the beak so that it readily fractured in a certain direction.—December 16th. Mr. J. W. Neville exhibited a specimen of fibrous coal from Hamstead, also a slide prepared from the same, showing dotted vessels; Mr. Linton, a collection of birds' eggs; Mr. Corbett, specimen of *Cystophyllum Siluriense* from the Wenlock limestone; Mr. J. Collins, a collection of local mosses; Mr. J. Moore, molluscan palates.—December 23rd. Special.—Conchology. Mr. J. W. Neville showed tropical land shells; Mr. P. T. Deakin, operculated land and freshwater shells; Mr. J. Madison, a case of twenty-five species of helices, all that are now living in the British Isles; Mr. Corbett, specimens of brain coral.—January 6th. Mr. J. W. Neville showed fossils from Llandovery limestone and Caradoc sandstone; Mr. J. Collins, a collection of mosses from Scotland; Mr. H. Hawkes, a rare marine algæ, *Sporochnus pedunculatus*, in fruit, from Devonshire.—January 13th. The President, Professor Hillhouse, M.A., F.L.S., in the chair. Mr. Lassetter exhibited a kingfisher shot at Olton. The subject of the evening was "Practical Microscopy," and exhibition of slides. Mr. H. Hawkes showed a series of botanical slides mounted in various media, and gave his experience of each; Mr. J. W. Neville, a collection of whale insects, in balsam, and a series of marine polyzoa, dry; Mr. J. Collins, preparations of freshwater algæ in media that still left something to be desired, for, though useful for scientific purposes, their beauty was much impaired. The President remarked that the arrangement of the chlorophyll could be fixed by the use of picric acid although the colour was lost. Mr. J. Mooie showed mounts in balsam and glycerine, with observations on these media. A discussion on the best methods of sealing fluid mounts closed the meeting.

THIRTY-FIRST ANNUAL REPORT

OF THE

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY,

PRESENTED BY THE COUNCIL TO THE ANNUAL MEETING,

FEBRUARY 4TH, 1890.

The Council have the pleasure of reporting the favourable position of the Society. The number of members has been maintained, and the surplus income has enabled the Council to pay off one-half of the loans that were contracted by the Society two years ago.

The Annual Conversazione was held on October 29th in the Examination Hall, Mason College, and resulted in more than usual success. The President, Mr. W. B. Grove, M.A., provided a collection of curious and beautiful fungi for exhibition, and a liberal supply of esculent kinds, chiefly *Agaricus ostreatus*, cooked and served with the refreshments, as a novel dish for the visitors. Amongst the exhibits were the fine original coloured drawings of British shells, "Gibsone's Conches," exhibited by Rev. B. W. Gibsone, of Hinckley; working models, illustrating the mode of flight of birds and insects, by Mr. E. Catchpool, of Sheffield; photographs of foreign scenery, by Mr. Councillor Clayton; collections of animals, insects, butterflies, and birds, including the rare bunting, *Emberiza cioides*, a unique British specimen, by Mr. R. W. Chase; a collection of lepidoptera from the neighbourhood of Birmingham, by Mr. F. Shrive; nests of living ants, by Mr. E. Catchpool; and nests of the trap-door spider, by Dr. Sankey, of Oxford. Also a number of photographic lantern slides, including some by Mr. E. H. Jaques; and a large collection of microscopes exhibited by members of the Society.

The Treasurer's annual financial statement shows the receipts of the Society for the past year to have been £150 9s. 8d., and the payments £153 13s. 4d., including the repayment of two of the £10 loans, and leaving a balance due to the Treasurer of £4 9s. 1d., instead of £1 5s. 5d. at the end of the previous year. There are now only three of the £10 loans remaining to be paid off, and the Council appeal earnestly to the members for their assistance in effecting this object by increasing the income of the Society by means of obtaining additional members.

The total number of members for the year 1889 is 202, being 1 more than in the previous year; of the total, 7 are

life members, 139 ordinary (guinea) members, 12 family (half-guinea) members, 7 lady (half-guinea) members, 5 honorary vice-presidents, 26 corresponding members, and 6 associates.

A special feature of the meetings of the year has been the illustration of several papers by extensive series of lantern photographs, which have afforded great interest and pleasure, and have attracted large attendances of the members and their friends.

The twelfth Annual Meeting and Conversazione of the Midland Union of Natural History Societies was held at Oxford on September 23rd and 24th. Mr. W. B. Grove and Mr. R. W. Chase attended as delegates from this Society. The meeting was a very successful one. Mr. T. H. Waller, B.A., B.Sc., received the Darwin gold medal for the series of Petrological papers which have been read before this Society. and published in the "Midland Naturalist." The Council congratulate the Society upon the pleasing fact that the Darwin medal has been won so often by its members.

MICROSCOPICAL SECTION.—Ex-officio: President, W. B. Grove, M.A.; Secretary, W. H. Wilkinson. During the year twelve meetings have been held, with an average attendance of twenty-nine; and the following communications have been made :—

March 5th.—The President's Address, being "A Review of the Progress of our Knowledge of Bacteriology during the last twenty-five years," illustrated by coloured drawings. The Address was highly appreciated by the members. It has appeared in the "Midland Naturalist."

The evening of April 2nd was devoted to a Microscopical Soirée, when a goodly number of members brought their microscopes, exhibiting specimens representing all the sections of the Society.

April 30th.—"Notes on a recent Tour through Spain," by Mr. G. C. DRUCE, F.L.S., of Oxford; illustrated by lantern photographs.

May 7.—A lecture on "Oceanic Islands, from a Collector's Notes;" illustrated by photographs of the Sandwich Islands, New Zealand, Fernando de Noronha, Australia, etc., by the Rev. T. SIMCOX LEA, M.A., the lantern views being shown by Mr. C. PUMPHREY.

June 4th.—"The Pocket Dredge for Microscopic Objects, etc.," by Mr. E. W. BURGESS. Communicated by Mr. W. P. MARSHALL, M.I.C.E.

October 1st.—"On a Disputed Point in the Structure of the Stomata of Plants," by Mr. HERBERT STONE, F.L.S.

November 5th.—"Growing Cells for Use with the Microscope," by Mr. W. H. WILKINSON.

At the section meetings a large number of specimens have been exhibited, and amongst many members may be mentioned Mr. W. B. Grove, M.A., fungi, mostly from the

Midland district, some very rare; Mr. Walliker, mosses and lichens from Wales and Germany; Mr. C. Pumphrey, insect palates; Mr. J. E. Bagnall, A.L.S., mosses from Sutton Park, and the plants collected in the Norfolk Broads by Messrs. C. Pumphrey and R. W. Chase. Mr. T. E. Bolton exhibited a number of living organisms in water under the microscopes. Mr. W. H. Wilkinson, a collection of beautiful foreign lichens, Perthshire moths and butterflies, and the curious dead-leaf insect, *Kallima inachis*, one of the many interesting cases of colour protection.

BIOLOGICAL SECTION (President, Mr. C. Pumphrey; Secretary, Mr. T. E. Bolton.)—During the past year eleven meetings of this section have been held, with an average attendance of twenty-seven, several papers of great popular interest having been given. Among the exhibitors have been the following:—Messrs. J. E. Bagnall, A.L.S., R. W. Chase, J. Edmonds, W. B. Grove, M.A., A. H. Martineau, C. Pumphrey, Herbert Stone, J. Udall, and W. H. Wilkinson. The following is the list of papers given:—

January 8th.—"On the Flight of Birds and Insects," by Mr. E. CATCHPOOL, B.Sc., of Sheffield.

February 12th.—"On the Structure and Function of the Air Bladder in certain Fishes," by Professor T. W. BRIDGE, M.A.

March 12th.—"On the Eyes of Insects and the Way they See," illustrated by lantern views and microscopic preparations; by Mr. H. M. J. UNDERHILL, of Oxford.

April 9th.—"On the Fin-whale Fishery off the Lapland Coast;" by Mr. A. H. COCKS, of Great Marlow.

May 14th.—"Plant Marches, or the Geological Progression of Plant Life;" by Mr. J. B. STONE, J.P.

October 8th.—"Photography as an Aid to Natural History Studies;" by Mr. J. EDMONDS.

November 12th.—"Notes on Amphioxus lanceolatus," by Mr. T. E. BOLTON.

December 10th.—"Sound-producing Organs in Fish;" by Professor T. W. BRIDGE, M.A.

GEOLOGICAL SECTION (President, T. H. Waller, B.A., B.Sc.; Secretary, John Udall, F.G.S).—Eleven meetings of this section have been held, and have been well attended, giving an average attendance of 38 per meeting; 150 members and friends were present to hear the paper on the "Norfolk Broads." The section has been very fortunate in the number of papers read, and the fulness of their illustrations; and the members are again indebted to Mr. C. Pumphrey for his continued assistance in illustrating several papers with the oxyhydrogen lantern. The thanks of the section are specially due to Messrs. Waller and Marshall, and Dr. Lapworth, for valuable aid during the session. During the year there have been

interchanges of invitations between this section and the Geological Section of the Birmingham Philosophical Society and the Vesey Club, Sutton. The following papers have been read:—

February 19th.—"Volcanoes of the Two Sicilies," by Dr. TEMPEST ANDERSON, of York.
March 19th.—Petrology of the Pebbles of our District," by Mr. T. H. WALLER, B.A., B.Sc.
April 16th.—"The Gulf Stream and its Effects upon the Climate of England and Norway," by Mr. W. P. MARSHALL, M.I.C.E.
May 21st.—"Gold-bearing Quartz of South Africa," by Mr. GRAZEBROOK, of Dudley.
June 18th.—"Picrites," by Mr. T. H. WALLER, B.A., B.Sc.
October 15th.—"Singular Water-worn Rocks in the Orkneys and Shetlands," by Mr. W. P. MARSHALL, M.I.C.E.
November 19th.—"Norfolk Broads," by Messrs. R. W. CHASE and C. PUMPHREY.
December 17th.—"Grey Wethers," by Mr. W. R. HUGHES.

SOCIOLOGICAL SECTION (President, W. R. Hughes, F.L.S; Secretary, Herbert Stone, F.L.S.)—A total of twenty-four meetings has been held, of which eleven were ordinary and thirteen supplementary. At the ordinary meetings the following papers have been read:—

January 22nd.—On "Tennyson's Country," by Mr. CUMING WALTERS.
February 26th.—On "Evolution in General," by Mr. W. B. GROVE, M.A.
May 28th.—On "Recollections of Dickens's Country," by Mr. W. R. HUGHES.
October 22nd.—On the "Principles of Sociology," by Miss CONSTANCE C. W. NADEN.
November 26th.—On "Robert Burton, Author of the 'Anatomy of Melancholy,'" by Dr. SHOWELL ROGERS.

At the supplementary meetings the following papers have been read:—

January 10th.—On "The Rhythm of Motion," by Mrs. BROWETT.
January 24th.—On "The Recapitulation and Summary of 'First Principles,'" by Mr. HERBERT STONE.
February 14th.—On "Evolution and Dissolution," by Mr. KINETON PARKES.
February 28th.—On "The Interpretation of Evolution," by Mr. HERBERT STONE.
March 14th.—On "The Instability of the Homogeneous," by Miss L. A. GOYNE.
March 28th.—On "The Multiplication of Effects," by Mr. COLBRAN J. WAINWRIGHT.
May 9.—On "Segregation," by Mr. HAROLD W. BUNCHER.
May 25th.—On "Equilibration," by Miss BYETT.
June 6th.—On "Dissolution," by Mr. ALFRED BROWETT.
June 20th.—On "The Summary and Conclusion of 'First Principles,'" by Mr. W. B. GROVE, M.A.
November 14th.—On "Super-organic Evolution and the Factors of Social Phenomena," by Mr. F. J. CULLIS, F.G.S.

November 28th.—On "Original External and Internal Factors of Sociology," by Mr. Alfred Browett.
December 19th.—On "Primitive Man—Intellectual," by Mr. Kineton Parkes.

An attempt to organise an excursion to Sutton Coldfield on Saturday, October 26th, was made, but owing to the small number of applications for tickets it was abandoned.

The section desires to place on record its deep sense of regret at the irreparable loss which the cause of Evolution has sustained by the early death of Miss Constance C. W. Naden, who for many years advocated the doctrine of the Synthetic Philosophy with a genius, ability, and enthusiasm rarely equalled.

The Library. — The Librarian (J. E. Bagnall, A.L.S.) reports that the library is in about the same condition as when last reported. It is to be regretted that it receives so little patronage from the members. Only 117 volumes have been taken out, and the number of members borrowing these books has been only 33. The following has been the issue of books for the year :—Botany, 38 ; Entomology, 10 ; Zoology, 11 ; Geology, 4 ; Microscopy, 21 ; miscellaneous, 33. It is hoped that the long-felt need of a catalogue to the library will soon be gratified, as by the exertions of Mr. Herbert Stone the manuscript for this is now in a forward state, and will soon be ready for the printer.

General Property.—The Curators (G. M. Iliff and Herbert Miller) report that the microscopes are in good order, with the exception of Collins No. 6, the rack of which requires slight repair.

THE PRINCIPLES OF SOCIOLOGY.

BY CONSTANCE C. W. NADEN.

(Concluded from page 34.)

We must not forget that although the primitive man is a rational, emotional, and social being, still he has not attained a very high degree either of reasoning capacity or of fitness for peaceful co-operation. He cannot generalise, or rather he does generalise to a certain extent, but his power of sustained thought does not suffice to disengage his generalisations from their concrete embodiments to place them side by side, and thus to discover a still higher unity. That is, he is incapable of what we call abstract thought. The Damaras, we are told by Mr. Galton, "puzzle very much after five (in

counting) because no spare hand remains to grasp and secure the fingers that are required for units. . . . . When bartering is going on, each sheep must be paid for separately. Thus, suppose two sticks of tobacco to be the rate of exchange for one sheep, it would sorely puzzle a Damara to take two sheep and give him four sticks."* Evidently the Damara has the idea of unity, but he cannot disengage or *abstract* it from its visible and tangible representation. In the same way the morality of the savage is guided by no determinate principle. He feels that certain modes of conduct towards others are right, and that the opposite modes are wrong; but the feeling is wavering, inconsistent, not understood even when most strongly manifested. What is enfolded in his nature requires to be elicited by stimuli from without, just as the seedling requires nutritive soil, air, and sunshine, before it can put forth leaves and flowers.

Climate, the structure of the earth's crust and the conformation of its surface, the flora and fauna of the inhabited region, are so many factors in the physical and mental—hence in the social—life of the inhabitants. A warm and kindly climate favours the growth of an infant society, because it does not unduly strain the bodily strength, and so gives opportunity for the growth of the inventive and artistic faculties. But at a later stage a temperate or even a cold climate conduces to sturdier development by making demands on ingenuity and on industry, and bracing up mind and body to increased effort. The influence of useful or noxious plants and animals, of geological structure, and of the natural features of the country, must be taken into account. One tribe finding a rich soil and a fine climate will settle to agriculture, while its neighbours lead the life of nomad shepherds, or continue to subsist by the chase. Imbued with the love of property—manifesting itself, alas! as the love of plunder—a tribe which has outgrown its boundaries or exhausted its resources makes war upon neighbouring tribes, and throws all its intellectual and physical force into a rude military organisation. It comes out of its petty struggles strengthened and disciplined, headed by a strong chief with a group of picked warriors by his side. Law and custom grow up as they are needed; language expands for the expression of new ideas; increase in numbers and greater social cohesion necessitate division of labour, and some kind of traffic, which again direct the inventive faculties of man to the improvement of his tools and the utilisation of the minerals which he

* Principles of Sociology, Vol. I., p. 84.

digs from the earth. Knowledge acquired from sheer necessity grows into embryonic science; interpretations and misinterpretations of nature generate an infantile theology, and the "play-impulse" causes the superfluous energies to well over in rude works of art and primitive epics. The process is in its nature progressive. For a community living under law, speaking and even writing an enriched language, trading, beginning to understand, or rather to *mis*understand, its surroundings with some degree of intelligence—a community which can build, can paint, can sing, can work in metals—has not only modified its pristine condition, but has introduced new and active factors into its internal economy. The next generation is moulded by these new factors, which it in turn remodels, and hence a "perpetual motion" is set up which cannot cease but with the extinction of the race. The growth and development of a society, as thus sketched out, bears an obvious analogy to the growth and development of an organism. Upon this analogy Mr. Spencer dwells in the second part of the "Principles of Sociology," but he takes care to note that it must be cautiously applied. The comparison is something more than a metaphor, something less than a definition. Any material or ideal whole which grows by assimilation and not by accretion, and which has interdependent parts, co-ordinated for some general purpose, may be said to resemble an organism, and to obey the laws of organic evolution. Language grows in this way, so does science, so does art. In the case of society, however, the analogy is more tempting, because the social units are themselves organisms, and the faculties which are evolved in them must necessarily be manifested in the community. We must, however, be careful to remember that the conception fails us utterly in the ethical sphere. Mr. Spencer himself observes that while in the animal body some of the cells "become specially sentient and others entirely insentient," in the body politic all the units are sentient; so that while in the animal the units exist for the benefit of the aggregate, in the society the aggregate exists for the benefit of the units. It might also be added that the units are intelligent as well as sentient, and that the society—not of course the material aggregate, but the ideal synthesis, without which not even the simplest community could exist for a moment—is present, though in varying degrees, in the mind and character of each of its members. Between the individual and the community there is no real antithesis, for the society lives in its units, just as truly as the units live in the society.

I have not time even to summarise the problems discussed in the important work which this section is about to study, and indeed I do not feel it either necessary or desirable that I should attempt the task. The section will read and comment for itself, and a running commentary is much better than a preliminary lecture. So I will only make a few suggestions as to the mode of study.

When reading on any great subject it is always well to make our text book a central point, from which lines of thought, and possibly of action, may radiate. But to find points of attachment for these lines we must go outside the text book, and seek in various quarters for facts, ideas, and arguments which bear upon its teachings. Confirmatory or contradictory, all must be taken into account, and we must never shrink from submitting to this test our most favourite theories, or the opinions of those masters of thought whom we respect most highly. This necessity has been duly recognised in the list of books appended to the circular announcing this meeting. In addition I may venture to suggest Professor Max Müller's Gifford Lectures published under the title of "Natural Religion," which contains his latest statement of that hypothesis which Mr. Spencer so powerfully combats. Then the "Asiatic Studies" of Sir Alfred Lyall, who is or has been a correspondent of Mr. Spencer, and has furnished him with not a few of his data, is worthy of careful perusal.

It is well also to note the curious sociological facts which we may often cull from newspapers and magazines, or meet with in the course of our general reading. For instance, I cut from the *Times* the other day a paragraph which might very well form a note to Mr. Spencer's chapter on the "Status of Women."

"THE STATUS OF WOMAN ACCORDING TO THE CHINESE CLASSICS.—In a missionary periodical published in Shanghai, Dr. Faber, a well-known scholar, publishes a paper on the *status* of women in China. He refers especially to the theoretical position assigned to women by the classics. These lay down the following dogmas on the subject:—(1) Women are as different in nature from man as earth is from heaven. (2) Dualism, not only in body form, but in the very essence of nature, is indicated and proclaimed by Chinese moralists of all times and creeds. The male belongs to *yang*, the female to *yin*. (3) Death and all other evils have their origin in the *yin*, or female principle; life and prosperity come from its subjection to the *yang*, or male principle, and it is therefore regarded as a law of nature that women should be kept under the control of men and not allowed any will of their own. (4) Women, indeed, are human beings, but they are of a lower state than men, and never can attain to full equality with them. (5) The aim of female education, therefore, is perfect submission, not cultivation and development of mind. (6) Women cannot have any happiness of their own; they have to live and work for men. (7) Only as the mother of

a son, as the continuator of the direct line of a family, can a woman escape from her degradation and become to a certain degree her husband's equal, but then only in household affairs, especially the female department, and in the ancestral hall. (8) In the other world woman's condition is exactly the same, for the same laws of existence apply. She is not the equal of her husband; she belongs to him, and is dependent for her happiness on the sacrifices offered by her descendants. These are the doctrines taught by Confucius, Mencius, and the ancient sages, whose memory has been revered in China for thousands of years."

I am not quite sure that similar ideas do not linger even to the present day in remote parts of our own island—and, indeed, in parts not so very remote, if we may judge by Mr. Grant Allen's extraordinary diatribe in the "Fortnightly" for October. If a Museum of Evolutional Psychology should ever be established—in the 21st century, let us say—that article will have a distinct value as a curious instance of reversion.

But the most practical part of the student's work is to examine his own prejudices, and to recognise them as survivals of beliefs which were once rational, but which now, undermined by maturer knowledge, are evidently destitute of foundation. This task would be one of the most important that the section could possibly undertake; though, perhaps, it will be best accomplished by each member acting as his own private inquisitor. When we have traced out the mixture of truth and error which constitutes our own beliefs, we shall be more ready and more able to perceive the rational element in the sociological conceptions of contemporary races. When I was in India last year, I was talking once to a very enlightened Brahmin, a university professor of Sanskrit, who had cast aside many religious and social prejudices, and was anxious to keep his little daughter of nine unmarried till the comparatively ripe age of twelve, if only his family and caste could be brought to consent to so great an innovation. I said something about the bondage of caste being the root of all evil, and asked whether he did not think that its fetters would soon be relaxed. But he gravely replied "No! I will speak to you quite frankly. My ancestors for ages back have come of a stock devoted to intellectual pursuits, and the love of these has become hereditary. I should not like to sully the purity of our blood by intermixing it with that of another caste engaged in meaner occupations. Does not Darwin show us that ancestral characteristics are reproduced in the offspring, and are preserved by natural or artificial selection?" I felt rather crushed by having Darwin brought down upon me in this unexpected manner, and although the Pundit's

argument was without doubt open to cavil, yet I could not help recognising that it was an argument just as good as many which are used for the support of some of our most cherished institutions.*

Another field for sociological investigation is suggested by the history of our own town—its rise and progress, and the social and political tendencies which are still in course of development. The fertile soil of the Triassic and Permian plains, and the mineral riches of the Black Country will have to be taken into consideration as the essential elements of our industrial prosperity. The manner in which this prosperity has stimulated the growth of the village into a small town, the small town into a great city, must be traced out, and the social revolution—for it is nothing less—caused by the invention and general use of machinery, by the factory system, by the present rapid communication between all parts of the kingdom, and indeed all parts of the civilised world, must be sketched in its general outline, and more minutely delineated in its local features. Last, not least, we must study that great democratic movement which began at the end of the eighteenth century, and which, changing its form again and again, and gaining force with every change, is ready at the end of the nineteenth century for still further transformations. With these data and inductions we may reach an intelligent comprehension of the strange metamorphosis which Birmingham has undergone within the last 140 years. In Dr. Langford's admirable "Century of Birmingham Life," we read the following curious account of Birmingham society in 1751 as gleaned from the local journals of that date:—He says that apparently "there were scarcely any events of a public nature worth recording. . . . . . All, or almost all, the public demonstrations are made on the celebration of some Royal birthday, or the arrival of the King from Hanover. . . . The allusions to anything like local public life as we understand it now are of the rarest occurrence. No police reports, no public meetings, no charitable appeals, no literature, no popular educational institutions, no popular lectures, no libraries, no newsrooms, no penny readings, no board of guardians, no town council, no debates of local senates, no orations of local senators to read, no leading articles, for there were no local events about which to write" (and I may add no Mason College, no Natural History and Microscopical

* While speaking of India, I may take the opportunity of saying that Mr. Spencer's works are known and appreciated among the more highly educated of the native gentlemen.

Society, no Sociological Section with its genial and able President). "All seems to have been a dull, dead level of monotonous existence, varied by occasional cock-fights and other brutal sports." The contrast with present conditions is almost ludicrous, yet the change has been brought about by natural and discoverable means. A philosophical history of Birmingham has yet to be written, a fitting work for some member or members of the Sociological Section. It must be undertaken in no vain-glorious temper, but in the true evolutional spirit, which does full justice to the past and the present and yet looks steadily onward to the future, never permitting its aspirations to crystallise into stolid self-satisfaction. A society like ours ought to find its ideal in that "possible future social type" which, in Mr. Spencer's words, "will use the products of industry neither for maintaining a militant organisation nor exclusively for material aggrandisement, but will devote them to the carrying on of higher activities"—a type which, instead of believing that "life is for work," will hold the inverse belief that "work is for life."*

THE LONDON MEETINGS OF THE CONGRÈS GÉOLOGIQUE INTERNATIONAL,

September 17th to 29th, 1888.

BY REV. G. DEANE, D.SC., B.A., F.G.S.

(Concluded from page 38.)

The remaining subject discussed at the Congress, and perhaps the most important of all, related to the nature and origin of the crystalline schists. This discussion had been prepared for by the publication of eight distinct essays by different authors collected into one volume. Translations of some of these papers have appeared in *Nature* for September of this year, p. 506, 519, and ff. The whole of the Wednesday's sitting and part of that of Friday were occupied with this subject. Professor Lory, of Grenoble, led off the discussion, and advocated the hydro-thermal origin. Then, after Mr. Macfarlane, of Ottawa, Canada, had avowed himself an ardent Plutonist, Professor Heim, of Zurich, spoke at length on the other side, maintaining in addition to general metamorphism, the metamorphism of contact, and mechanical

* Principles of Sociology, Vol. I., p. 563.

deformations as the origin of the schists. Dr. Sterry Hunt declared himself a disciple of Werner, and traced everything to chemical action. Dr. Hicks believed the whole of the schists which occur in great masses to be Pre-Cambrian, and M. de Lapparent went even further in this direction ; and, as the "Procès-verbal" sagely observes, expounded his personal views of the primitive earth too summarily for the taste of his hearers *(trop sommairement au gré des auditeurs).* Indeed his view of the Pre-Cambrian ages closely resembles the view of some worthy people as to the latest in the future.

This was on Wednesday ; and on Friday the discussion was renewed with increased ardour and some of the same speakers came up to the mark again like giants refreshed. Dr. Sterry Hunt in particular, who, it will be remembered, twenty years ago started some curious though ingenious speculations as to the chemistry of the primeval earth, emphasised his views, and maintained that pressure by itself would not produce heat unless movement was checked. The schists were due to crystallisation under the influence of mineralizing waters, and chemical affinity gave birth to minerals. Dr. Hunt was replied to by Dr. Lapworth, who advocated the principles you know so well, practically the same as those of Heim (of Zurich) and Lehman (of Kiel).

It is singular and interesting to find this old controversy of more than 100 years ago re-appearing in another form in London now; and moreover with the antagonists face to face in the same room. However the "killed and wounded" were not injured, and keen discussion leads to truth.

The sitting on Saturday was mainly occupied by votes of thanks, routine business, and a short final address from the President. But Professor de Lapparent brought up the report of a committee appointed for the purpose, which introduces a new feature in the constitution of the Congress. No contested vote was taken in London; the number of English geologists present could have swamped the whole of the foreign ones. And it is evident that this state of things is likely to be permanent. Native geologists will generally outnumber foreign, because if the natives were not strong in geology they would not be likely to invite the Congress. Accordingly it was decided that in voting, the votes of the native and of the foreign members should be taken separately. If the votes of the two agreed, the question should be considered settled; if otherwise the question should stand over for further consideration. Also it was recommended that votes should not be taken on purely theoretical questions, but only on matters of practical importance.

I am afraid I have been tedious, but now I pass to lighter subjects, viz.:—

II. The afternoon visits to places of interest, and the evening receptions.

The morning meetings generally ended about 1 30. On Tuesday a visit was made to the British Museum, when Mr. Franks explained the collections of prehistoric archæology; and on Wednesday the Natural History Museum at South Kensington was the centre of attraction. Professor Flower, the director, gave a speech in English relating the history of the museum, and describing its contents. Thursday afternoon was devoted to excursions, of which there were three. One party, consisting of foreign members only, went to Windsor and Eton, on the invitation of the professors of Eton College. Another to Kew, on the invitation of the director, Mr. Thistleton Dyer. A third to Erith and Crayford. As I knew Kew very well and did not know Crayford, I joined the last. We had a magnificent afternoon, clear and bright with a pleasant breeze, which was very grateful after the close air of London. About eighty of us, including many foreign members, under the direction of Messrs. Whitaker, Goodchild. Bernard H. Woodward, Dr. John Evans, and others, explored the Woolwich beds, Thanet sands, and brick earth of those localities. We were joined by Mr. Spurrell, who showed us the site of the Palæolithic implement workshop which he had discovered at Crayford, and exhibited a series of flakes found there. Any number of fossil shells were to be found; and one of the foreign members was fortunate enough to discover a piece of a mammoth's tusk, which he carried off in triumph. As we returned from Crayford the sun set in splendour; as we entered London the moon rose in brilliance. Fine weather adds much to the joy of an excursion.

The evening receptions were three. On Monday at the close of the President's address, he and Mrs. Prestwich welcomed the members in the Library of the University; on Wednesday Dr. A. Geikie, Director General of the Geological Survey, received at the Geological Museum in Jermyn Street; and on Friday a farewell conversazione was given at the Geological Society's Rooms in Burlington House by the President, Dr. Blanford, and Mrs. Blanford. This was very numerously attended, and was a very successful gathering for social intercourse. Also there was a good show of microscopic exhibits. Still the difficulty of language supervened here. All the tongues of the civilized world intermingled, and, if you shut your eyes, you might imagine

you were at the foot of the Tower of Babel. The diplomatic French was drowned in discordant sounds. Dr. Lapworth vainly tackling a Russian, appealed to me for help, and found I was worse off than himself.

Thus the work of the morning was relieved by the recreation of the afternoon and evening; and, so far as the exigencies of various languages permitted, the discussions of the meetings were continued in friendly talk.

I might here, perhaps, say a word or two about the excursions during the week following the meetings in London, although I was personally unable to attend any of them. An elaborate description of the localities to be visited, with numerous maps, sections, and plates, had been prepared under the editorship of Mr. W. Topley. This volume of two hundred pages forms a valuable document for English geologists; as, in addition to maps and sections, it contains full references to the Bibliography of the several districts. The proposed excursions were six in number:—

1.—Isle of Wight; under the direction of Messrs. Whitaker, Gardner, A. Strahan, and H. Keeping.

2.—North Wales; with Dr. Hicks, Professor Blake, and Mr. G. H. Morton as leaders.

3.—East Yorkshire; Messrs. J. W. Woodall, Fox Strangways, and G. H. Lamplugh.

4.—Norfolk and Suffolk; Messrs. F. W. Harmer, Clement Reid, and Dr. J. E. Taylor.

5.—West Yorkshire; under Messrs. J. E. Marr and R. H. Tiddeman.

6.—Central England; Professor Green and Mr. H. B. Woodward directing.

Such was the programme; but, as I could not attend any, I do not know how it was carried out.

III.—I come now to the Geological Exhibition, which was worthy of the meeting.

Dr. Lapworth, Dr. Geikie, Professor Blake, M. Torell (of Stockholm), and others exhibited a series of maps, charts, and sections. To myself the most interesting exhibits were as follows:—

A fine collection of Swiss rocks and fossils, by Professor Heim, in illustration of his views on the crystalline schists.

Dr. H. J. Johnston-Lavis, who has been living at Naples and studying Vesuvius, exhibited the results of his work.

Professor Prestwich, Dr. J. Evans, and Mr. Spurrell showed fine collections of flint implements and other things, illustrating the Erith and Crayford excursion. In one instance, Mr. Spurrell had succeeded in building up a whole

host of flakes upon the core from his palæolithic workshop into the original flint from which they were chipped, though, of course, there were gaps, as some were missing.

Dr. Hicks was to the fore with Pre-Cambrian specimens, and Dr. G. J. Hinde with silicious rocks from carboniferous strata. Dr. Hatch exhibited some very fine granite concretions, and Professor Judd a most interesting series of deposits from the borings in the alluvium of the Nile delta. A series of specimens exhibited by Professor Bonney from Charnwood, The Lizard, and other districts, gained much attention.

There were also some remarkably good mineralogical specimens, including a magnificent mass of tin ore in the matrix, and a cassiterite crystal weighing 20lb. from Dacotah.

IV. It now remains for me briefly to sum up the advantages of such a Congress and its future work.

With the increased facilities of modern travel, the tendency of all associations is to extend the sphere of their operation. Four years ago the British Association for the Advancement of Science went to Montreal, and has even talked of a visit to the Antipodes. The Library Association of the United Kingdom decided to hold its next meeting in Paris ; but this intention has since been altered, and the meeting will be held in London. For Geology there are obvious reasons why such a gathering should occur from time to time ; and it is almost a wonder that the scheme was not started earlier than it was. From the growth of the Congress during the last ten years, it would seem not unlikely that at some distant date it may assemble in Southern, or even Central, Africa, to explore the Triassic and other deposits there. But this is not yet.

We are favoured in Britain with representatives of most of the geological systems. But, though Britain may be, so to speak, the ὀμφαλός, the living centre of geology, it is not by any means the whole of it ; and other countries must supply the gaps existing here. Denudation and deposition must in all ages have been going on permanently and constantly somewhere or other on the earth's surface ; the other geological agencies must have been in action permanently and constantly, and their results would show themselves somewhere or other at the earth's surface ; and hence the lack of one district is made up by the fulness of another. So long then as each country confines itself to its own territory it will have only an imperfect and perhaps inaccurate geological record. But let the fulness of one land supply the deficiencies of another, and we may ultimately reach a full, accurate, and comprehensive knowledge of the whole geological series from

the earliest ages to the present time. Hence the need for comparing notes from time to time with the investigators of other lands; for friendly intercourse with foreign geologists; and, if need be, for that active conflict, battle, and strife of idea and thought which ever leads onwards in the path of truth.

Then, again, it appears to me to be a good thing for the advocates of opposing systems and rival theories to meet together face to face and discuss freely and frankly their differences. Most controversies have their rise either in the indefiniteness of terms or in misunderstanding the real meaning of speakers and writers. And though it be difficult to fully thrash out the matter when speaking in public under the trammels of a foreign tongue, yet personal interviews, with the aid of judicious interpreters, will enable a clear discussion of the points at issue.

Had Werner and Hutton and their followers, a century ago, instead of firing useless and sometimes red-hot shots at one another from a distance of some hundreds of miles, been able to meet together in Edinburgh or Freyberg, or even in Paris, Bologna, Berlin, London, or Philadelphia, they might have got nearer to one another in theory; but anyway much of the violence and acrimony of controversy would have been saved. The amenities of friendly intercourse would have poured oil upon the troubled waters of strife.

Further, the stimulus given to the workers in different countries by such a Congress is a thing not to be lightly esteemed. And the encouragement which those of different lands may gain from feeling that they are working together for a common object, and for a great purpose, is surely a source of fuller power.

Finally, the literature called out by such a gathering is eminently useful, not only to those who are able to attend, but to all workers in the subjects. The public discussions may, to some, fail of their force; but, as I said at the outset, the written record remains, and many who were present in London will doubtless con again and again the written records of that most successful Congress.

I have thus endeavoured to give you a résumé of what was to me one of the most instructive and most pleasant series of meetings I have ever attended. For many of us—for most of us—it is not possible to go long distances, or to spend much money; but we all may share more or less in the gathered results of the labours of others. And I believe that the future of the Congrès Géologique International will be a potent factor in the progress and development of geological science.

SOME NOTES UPON A PROPOSED PHOTOGRAPHIC SURVEY OF WARWICKSHIRE.

BY W. JEROME HARRISON, F.G.S.,

VICE-PRESIDENT OF THE BIRMINGHAM PHOTOGRAPHIC SOCIETY; AUTHOR OF THE "HISTORY OF PHOTOGRAPHY;" "PHOTOGRAPHY FOR ALL," ETC.

(Continued from page 46.)

SCIENTIFIC STUDIES FOR WARWICKSHIRE PHOTOGRAPHERS.—Archæology — the study of the past,—and Ethnology—the study of the inhabitants of the district at the present day—we have already touched upon. But there is much work also to be done in Geology, Botany, and Zoology.

THE GEOLOGY OF WARWICKSHIRE.—The coloured maps issued by the Geological Survey show the different strata of which the surface of the county is composed; and in a book which I wrote in 1881* a general description of the rocks of the county will be found.

Every landscape depends for its main outlines upon the rocks which lie beneath the soil; and for those who can "read the rocks" the study of the scenery of any district has a double pleasure. The oldest rocks of Warwickshire are the Cambrian quartzites and shales which lie between Atherstone and Nuneaton. These had been wrongly assigned to the Carboniferous period by the Geological Survey, and the discovery of their true age was made by Professor Lapworth and myself in 1882. The quartzites (altered sandstones) are magnificently exposed in a series of immense quarries, and they are traversed by great masses of dark igneous rocks. The shales are well seen in the Stockingford railway cutting.

In the Warwickshire coal-field, photographs of the surface works, collieries, and colliers might be secured; while, descending beneath the surface, the flash-light would enable us to secure interesting records of the mines and miners.

Of the Triassic strata which succeed, there is a fine section of the red sandstone, sixty feet in vertical height, at Hockley Cemetery, in Birmingham. Elsewhere the Triassic rocks are but seldom exposed, and we must be content with noting the level plains and rolling hills produced by their marls and sandstone.

The Liassic strata—limestones and clays—which rest upon the Trias, are quarried at Wilmcote, Binton, etc., in

* "Geology of the Counties of England, and of North and South Wales." Kelly and Co. Now out of print.

South Warwickshire. The fossils contained in these and in other local rocks, of which there is a grand series in the Warwick Museum and in the Museum of the Mason College, Birmingham, will form interesting subjects for our cameras.

Lastly, we have the Drift, including those confused beds of clay and sand often containing great blocks of rock (erratics) which have been conveyed from Wales or from Scotland by the agency of ice during the glacial epoch. The immense boulder which lies in Cannon Hill Park (Birmingham) is a fine example of such a travelled block; but there are hundreds of others, and they are continually being destroyed—the farmers blow them up with dynamite. So, too, with the sections—the quarries, railway cuttings, etc.—where the solid rocks are finely exposed. They change from day to day, until at last they are grassed over and lost. Let it be our task, by the aid of photography, to record their features for ever for the students of geology.*

THE BOTANY OF WARWICKSHIRE.—The flora of our county has been carefully studied and described by Messrs. William Mathews, M.A., J. E. Bagnall, A.L.S., W. B. Grove, M.A., and other specialists. Artists have long visited our parks—Packington Park especially—to portray the grand old trees which adorn them, remnants of the old forest of Arden. Photography can admirably record every twig and leaf. It is certain that good photographs of plants, especially if taken while growing in their native haunts, would help to vivify the dry leaves of herbaria, and they would be much valued by those who study and teach botany. I have seen some exquisite work in this direction done by one of our members, Mr. Charles Pumphrey. Let me advise those who make this branch a speciality to photograph trees either early or late in the day, when the nearly horizontal rays illuminate their trunks. Let photographs of the same tree be taken at different seasons of the year; then shall you be able to prepare a series of "dissolving views," in which the tree shall be shown to bud and blossom, be covered with leaves, and anon be bare, yet beautiful with frost-rime.

ZOOLOGY OF WARWICKSHIRE.—In the minute life which occupies our ponds and ditches there is a never-ending field of work for the photographer who combines the camera with the microscope. Some of us know, too, that it is better fun to hunt with the camera than with the gun; and we hope to be able to photograph the local birds, etc., in their native

* See paper on "Aid Rendered by Photography to Geology," by W. J. Harrison, "Photographic News" for 2nd October, 1885.

haunts, and so to secure pictures which shall surpass the best efforts of the taxidermist.

METHODS OF CONDUCTING THE PHOTOGRAPHIC SURVEY OF A DISTRICT.

There are several ways in which the photographic survey of any district may be carried out.

I.—First we have what may be called the "no method." Each member of the society or body by which the survey is to be carried out wanders at will over the district, photographing whatever pleases his eye, and sending in his negatives or prints to the managing committee. It is not necessary to point out the demerits of such a scheme.

II.—If there is any good, modern, and tolerably cheap county history in existence, it might well furnish the groundwork for a general photo-survey. Lists of all the places and objects named in its pages should be drawn up, and grouped according to locality; each division being then allotted to those workers who have volunteered their services. For Warwickshire the recent publication of an admirable County History,* by Mr. Sam Timmins, offers a capital opportunity, the more especially as the book itself contains no illustrations. Any member who wishes to form a very valuable and interesting volume can do so by pulling Mr. Timmins's book to pieces (which is just what its reviewers have *not* done), interleaving it with a series of illustrations such as I have suggested, and then having it rebound.

III.—But for an exhaustive photo-survey of Warwickshire, or of any other district, I believe the plan must be based upon a large-scale and accurate map; and we must go to Nature herself for our illustrations. Fortunately we are now provided with a map or maps (the work of the Government Ordnance Survey), which are in every respect admirable.

(a.) THE OLD ONE-INCH ORDNANCE MAP.—Warwickshire was mapped on the scale of one inch to one mile as long ago as 1830. This map is sold in "quarter sheets" at one shilling each, each quarter sheet including about 160 square miles. The entire county on this scale makes a map 59in. by 42in., which is sold in sheets for 17s. 6d.

(b.) THE NEW ONE-INCH ORDNANCE MAP.—The map described in the last paragraph is now, in some respects, out of date. But a new one-inch map is being prepared (by reduction from the six-inch map) which will be a great improvement.

* Published by Elliot Stock, price 7s. 6d.

It will be similar in size and price to the old one-inch map. We can hardly expect to have this map for Warwickshire for a period of several years.

(c.) THE SIX-INCH ORDNANCE MAP.—This is the ideal map for the work of a photo-survey. Its large scale (six inches to every mile) allows every field, and even every tree, to be depicted. The orientation of buildings is clearly shown, so that the photographer can see beforehand when the light will fall suitably upon any building, ruin, etc., that he may have to travel a long distance to photograph. The issue of the Warwickshire map on this scale is very nearly complete. The county is contained in 200 quarter-sheets, each measuring 18in. by 12in., and including six square miles. They are sold at one shilling each, and 195 have been published.

(d.) The PARISH MAPS are on the still larger scale of twenty-five inches to a mile. Four of these parish maps contain an area equal to one quarter sheet of the six-inch map. Each parish map measures 38in. by 25¼in., and contains an area of a little more than 1½ square miles. These also are all but complete for Warwickshire; and in some cases, as in Stratford, the ruins of Kenilworth, etc., they will be very useful to the photo-surveyor.

(e.) Lastly, there are the town plans, on the scale of 125 inches to a mile.

PLAN NOW PROPOSED FOR THE PHOTO-SURVEY OF WARWICKSHIRE.

1.—A committee must be appointed by whom the details of the plan can be formulated.

2.—The maps of the county on the six-inch scale must be purchased. For each sheet of the map there must also be a light cardboard box* bearing the same number as the map. In this box, mounted prints of all the photographs taken from objects contained in that sheet of the map should be kept.

A similarly numbered set of negative boxes† would be needed to contain the negatives belonging to each sheet of the map.

3.—All photographers who would be willing to place their services at the disposal of the society should send their names (in pairs if preferred) to the committee.

4.—The committee would decide on a certain patch of country to be surveyed—say that included on twelve sheets of

* Those sold for holding pamphlets, papers, etc., by Stone, of Banbury, would answer well for this purpose.

† Those made by Arundel and Marshall, Penn Street Works, Hoxton, London, are recommended.

the six-inch map, if twenty-four names were received. They would then allot the maps by ballot or otherwise among the workers, giving one map to each pair.

5.—Let us suppose that two friends, A and B, are allotted a certain area, say that contained in one quarter sheet of the six-inch map, including an area of six square miles.

They carefully study the map and draw up lists of the promising points. They read up the history of any churches, ruins, or other monuments of the past included within it. Then they visit it for the first time, *without their cameras.* They walk across and across the district, calling perhaps at the inns, the farm house, or the rectory, gaining information and jotting down places and times when the light will be favourable. On their next visit they are accompanied by their cameras, and the negatives necessary to illustrate the area—perhaps only two or three, perhaps ten or twenty—are soon secured; or a second and third visit are paid if necessary. Prints are then taken and lantern slides made, and the results are handed over to the committee.

6.—If a sufficient number of subscribers could be obtained, it would be very desirable to publish, perhaps monthly or quarterly, a selection of the most interesting photographs obtained, accompanied by descriptive letterpress. There must be many people in the county who would prize such a local record.

7.—The principal books and works of reference upon the county should be added to the library of the Society; and lists of the large collections of books, etc., on the same subjects contained in the local libraries, should be posted on the walls of the club rooms.

8.—One night in each week might be considered a "rendezvous night," on which all who were interested in the work of the survey should meet at the club rooms; and on (say) one evening in each session of the Society there might be a more public display of the results which were being obtained. The year's work in this direction would naturally form an important feature of the Society's annual exhibition.

SOCIETY EXCURSIONS UTILISED.—Everybody knows the routine of an ordinary excursion of a photographic society. Some well-known spot is selected, the further away the better, as North Wales, Dovedale, Haddon Hall, etc. If the day is fine twenty or thirty members attend, and they go round the place in a crowd, occupying themselves to a large extent in getting in, and out of, one another's way.

I would suggest that the excursions be made local, and that a routine of work be drawn up beforehand,

in which each detachment of three or four members should be assigned some particular task to accomplish. Thus in a half-day excursion to Warwick, suppose twenty camera-carriers present themselves; let this number be divided into five sets of four members each, the tasks being as follows:—(1) The Castle and Grounds; (2) St. Mary's Church, including the Beauchamp Chapel; (3) the Leycester Hospital; (4) the Town of Warwick generally, its two gates and old buildings; (5) Guy's Cliff. Given a fine June afternoon, and the work of the survey for that town might be accomplished very rapidly on this plan. But it supposes that a full programme, showing the work of each section of the party, be drawn up beforehand and distributed.

UTILISATION OF WORK ALREADY DONE.—There are probably in existence already some hundreds, or even thousands, of photographic negatives which would be of service in the history of Warwickshire. It must be part of our task to draw up a list of such negatives, showing their subjects, their owners, etc. Some of them may, perhaps, be acquired by gift, loan, or purchase. A separate record book should be kept for those negatives which are already in existence; and a circular asking for information on this subject might be addressed to the professional photographers of the county.

(*To be continued.*)

Review.

Transactions of the Burton-on-Trent Natural History and Archæological Society. Edited by G. HARRIS MORRIS, Ph.D., F.C.S., F.I.C., Honorary Secretary.—London and Derby: Bemrose and Sons. Price 5s.

THE Burton Society are to be congratulated on the issue of the first volume of their Transactions. It is a well-printed volume of 194 pages, with a number of illustrations, contained on more than twenty plates. The contents are very varied, consisting chiefly of papers read before the society or one of its sections during the past few years. The most important paper is an interesting "Report of the Stapenhill Explorations," by Mr. John Heron, F.C.S., F.I.C., honorary secretary of the Exploration Committee, illustrated by eleven plates, one of which forms the frontispiece to the volume. Every society in the Midland Union ought to possess a copy of this volume.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—BIOLOGICAL SECTION, February 11th. The President, Mr. Charles Pumphrey in the chair. Mr. F. W. Carpenter exhibited fungia or mushroom coral from the Scilly Isles. Mr. A. H. Martineau,

Hessian Fly (*Cecidomyia destructor*) puparia in wheat and barley straw which had been prevented from emerging at their proper time by confinement in the dark. Mr. C. F. Watson, sections of Oleander leaves, showing pits on the under surface into which the stomata open. —GEOLOGICAL SECTION, February 18th. Mr. T. H. Waller, B.A., B.Sc., chairman. Mr. Waller read his paper on "Some Silver Ores from the Barrier Range of New South Wales." The paper was largely illustrated by hand specimens. A cordial vote of thanks to Mr. Waller concluded the business.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—January 20th. Mr. T. Hickin read a paper on "The Sun." After speaking of the solar system and its relation to its centre, the writer gave the dimensions of the sun and described its envelope or photosphere and the spots on its surface, with their movements. It was found these spots varied in number over a period of eleven years. The peculiar appearance of the spots under high powers was described at some length. The red prominences seen on the sun during an eclipse were spoken of and their effect on the spectroscope shown. The paper concluded by describing the course of the solar system in the direction of the constellation Hercules. The paper was illustrated by a series of lantern pictures.—January 27th. Mr. J. W. Neville showed specimens of ammonites, in section and otherwise, from Lyme Regis; Mr. A. Camm, *Clathroptychium rugulosum*, from Sutton Park, a fungus new to Mid-England; Mr. Lassetter, a series of Silurian fossils from Aldridge; Mr. G. Corbett, jaw and vertebræ of Ichthyosaurus, from Wilncote; Mr. Hawkes, fern spores in coal.—February 3rd. Mr. H. Hawkes exhibited a collection of New Zealand ferns, also one of Indian plants; Mr. Lassetter, a specimen of *Gorgonia flabellum*.—February 10th. Mr. J. Madison exhibited a peculiar form of anodon from the Warwick Canal, the shell being so altered as to make the species uncertain; Mr. J. Collins, a white-banded variety of *Limnæa stagnalis*, from Yardley.—February 17th. Professor Hillhouse M.A., F.L.S., gave a lecture on "The Continuity of Protoplasm" giving the results of the most recent observations. The lecture was illustrated by models and diagrams.

OXFORD NATURAL HISTORY SOCIETY. — Tuesday, January 14th. The President in the chair. This was the Annual Meeting for the Election of Officers. Mr. E. B. Poulton, M.A., F.R.S., was re-elected President; Messrs. H. M. J. Underhill and G. C. Druce, Secretary and Treasurer respectively. There were also elected nine Presidents of Sections, and four other members of the Committee. Mr. Druce read a paper on "Herbaria." In the discussion which followed, Professor Vines alluded to the fact that the discovery of Reggio's herbarium (now exhibited to the Society) was due to Mr. Druce. Mr. Poulton gave his paper on "The Influence of Cold on the Change of Colour in Arctic Animals," and a discussion followed. — Tuesday, January 28th. Mr. Druce in the chair. Mr. H. Balfour gave a lecture on "The Origin of Art as illustrated by the decorative Art of Savages," which will appear in an early number of the "Midland Naturalist."—Tuesday, February 11th. Professor Vines in the chair. Mr. Farmer read a paper on "Some Relations between Insects and Plants." The lecturer noted the fact that the "struggle for existence" between different individuals and species of plants, though less obvious in their case than in that of animals, was no less real. Any newly turned up piece of ground, left to itself, will give an instance of this—a struggle for precedence between different species, resulting in a final equilibrium. Such

knowledge has been at times turned to useful ends. The New Zealand streams clogged by the rampant growth of an introduced foreigner—watercress—were found to be cleared by planting willows along the banks. The white clover will turn out the objectionable knot grass. In the tropics the struggle is greatest, as growth goes on all the year, the only alternation of seasons being between wet and dry. Hence the frequent modification to their surroundings found in tropical plants, instanced, for example, by the Cacti and Euphorbiæ with leaves and prickles modified, on the one hand to forbid the ravages of cattle, on the other, to prevent evaporation. Now to pass to the special subject. Apart from the question of fertilisation, there are certain plants whose existence entirely depends upon the existence of certain insects. These insects are ants, which in the tropics, are to be numbered by millions. Many of them are far larger and more ferocious than any in temperate climes. Among them is a genus of leaf-cutting ants, Atta, found in great profusion, marching backwards and forwards in long files between some forest tree or shrub and their nest, each returning ant bearing with it a piece shorn out of a leaf, bigger than a sixpence. The result of such constant spoliation, if unchecked, must be to the tree—weakening of the reproductive powers, decay, eventual death—as happens to the coffee plants in Ceylon, whose leaves are destroyed by a fungus. Many trees are so attacked by the ants. A good example is one of the Cecropias—a forest tree, allied to the Bread-fruit, like a gigantic candelabrum. What can the plant do to obviate the mischief? The Cecropia sets to work in an apparently wasteful way. It maintains a standing army of ants of another species, small but ferocious, to keep off the ravaging species. For its allies the tree provides both house-room and food. Its stem is thick, hollow-jointed like bamboo, but with shorter joints. From each joint springs a leaf, and above the leaf is a hole. This hole is bitten by the ant through a thin spot, apparently left for that purpose, and thus access is gained to the room which it inhabits in the hollow of the tree. Also the tree provides food for its garrison. Just above the hole is a triangular mark at the base of the leaf-stalk. Closely examined this is found to consist of small albuminous bodies which the ants feed on. The garrison ants earn their food and shelter. The wood-cutter's task is a most objectionable one, carried on, as it is, under a rain of biting ants. The marauding Attas, spite of their size, are horribly afraid of their diminutive opponents, and beat a hasty retreat at sight, leaving the tree unassailed. An example was shown of an Acacia from the Botanic Gardens, similarly adapted to the garrison of defending ants. Here the tip of the huge hollow thorns furnished the weak spot through which the hole was gnawed for entrance, while the apex of each leaflet provided an oval-pointed body of albumen grains, and in the leaf stalk were little glands secreting honey. Honey glands, extra-floral nectaries, are found on many plants. An absurd explanation had been given that they are meant to attract the attention of insects from the nectary of the flower, *i.e.*, by paying black mail to save the flower honey. Doubtless in many cases they are meant to attract ants. The first three opening leaves of the Aspen Poplar have them; ants ascend and keep off leaf-devouring insects. When the leaves grow tough the glands disappear. The Banksia Rose has them, and this is the only rose that is not infested by the leaf-cutting insect. The Rev. G. J. Burch exhibited and explained an ingenious contrivance for showing and calculating the rate of the motion of the cilia of Infusoria under flashing light, some account of which will appear hereafter in this magazine.

CONSTANCE C. W. NADEN:

A MEMOIR.

Part I.

"Sigh not 'so young!'—'such promise!'—'Ah! a flower
That longer life had sunned to fruit of gold.'
Be still and see!—God's year, and day, and hour,
By lapse of mortal minutes is not told."

Ilicet, Sir Edwin Arnold.

Miss Naden is dead! Such were the sorrowful words spoken with "bated breath," and sympathetically passed on by the few intimate friends who received them about mid-day on Tuesday, the 24th of December last, with a feeling akin to that "hoping against hope" which mortals are prone to cling to, peradventure they might by any possibility be afterwards contradicted. Alas! they were but too true, for their verification appeared in the evening journals,

"And sadly fell our Christmas-eve,"

as we realised the full force of the sudden and unexpected blow that had deprived the world of a fine—possibly an original—thinker, Birmingham of one of its most gifted daughters, our Sociological Section of its most distinguished worker, and the writer of these lines of a warmly attached friend.

It is an exceptionally rare privilege to record the higher intellectual, and especially the philosophical, achievements of women, although our present educational system—in which, thanks largely to the influence of Mr. Herbert Spencer's work on education, and to the persistent and devoted labours of Professor Huxley, science has now a place—will doubtless develop more numerous instances in the future; but those who were privileged to know and understand Constance Naden and her aims and writings and powers best, presaged for her a future second, perhaps, only to George Eliot herself. A comparison, however, between the two ladies is scarcely possible—the latter died at 61, having completed her work—the former at 31, having scarcely begun it. Miss Naden had certainly the advantage of a better education, and she gave substantial evidence in the good work which she left behind her of far better that might have been forthcoming in the future. One point is very interesting to record—the early Evangelical training of both was somewhat similar, and they both subsequently exchanged the old for the new standpoint.

The cause of evolution has suffered severely by her premature dissolution, for she brought to bear on its promulgation, not only a woman's sympathy and a poet's instinct, but also a philosopher's acumen. And now, indeed just at the very commencement of her work, and enriched as she was with the rare combinations of genius, will, leisure, and ample means, one of its ablest and most devoted exponents is abruptly silenced for ever!

It is impossible within the brief limits of space allowed by a scientific journal, to do adequate justice to the merits of this many-sided and beautiful character. The writer's experience of his lost and highly valued friend only extended from 1884, during the time of her later studentship at the Mason College, and subsequently until the end came in 1889; but a few details of her early school life—and later student life—have been supplied from several trustworthy sources; and such particulars relating to her college career, from a professorial point of view, as are of public interest, have been most kindly and sympathetically written by Professor Tilden, D.Sc., F.R.S., one of her teachers, as a supplement to this notice.

Constance Caroline Woodhill Naden was born at No. 15, Francis Road (formerly Francis Street), Edgbaston, January 24th, 1858, and was the only child of Mr. Thomas Naden, now President of the Birmingham Architectural Association, and Caroline Anne, only daughter by his second wife (a Miss Field) of Mr. J. C. Woodhill, Pakenham House, Charlotte Road. Mrs. Naden died on the 5th of February following, and it is touchingly recorded that when the final parting came between her mother and the young wife, the latter said "You will have baby!" That sacred trust was at once acknowledged and faithfully kept, for the little infant was taken and adopted by the grand-parents (Mr. and Mrs. Woodhill) when only twelve days old, and with them she lived until their decease, and for whom she ever entertained the most loving and devoted affection. Mr. Naden, on the death of his wife, left Francis Street, and also resided at Pakenham House for some considerable time. Twenty-three years afterwards her first volume of poems, "Songs and Sonnets of Springtime," was dedicated in a sonnet to these "guardians true;" and it may be doubted if the English language contains a much more beautiful or tender memorial of filial gratitude. It was a happy home at Pakenham House. "Little Consie," the pet name by which she was endearingly called, was perfectly

idolised by the grand-parents, who religiously kept every scrap of her writing and drawing, but they never spoiled her. Nothing remarkable is remembered of her uneventful childhood, except her extremely retentive memory and her absolute veracity. A writer in a contemporary truly says:—"So intense was her love of truth that deception or prevarication were simply impossible to her." She was baptized in St. Mary's Church, Birmingham, but while she resided with her grand-parents she attended—as I am informed by a relative—the Wycliff, Mount Zion, and Church of the Redeemer Baptist places of worship. She was first taught to read by her grandmother, a lady of refined culture, the method adopted being that of a little book called "Reading without Tears," where she learned the words at sight without first learning her letters. The method commends itself as being in harmony with that procedure, "from the simple to the complex," laid down by Mr. Herbert Spencer in his "Education," as illustrated by "the modern course of placing grammar not before language but after it."

Her old nurse and foster mother (Mrs. Pratt) affectionately treasures (and recently exhibited to me with natural pride) a series of seven photographs taken at various periods during the life of her "dear lamented darling," from that of a lovely baby in arms of twelve months until the age of thirty-one years, which show most interestingly the evolution of the features from the earliest commencement up to the highly intellectual face brought out by the well-known Whitlock portrait, taken in 1887.

When eight years old she was sent to a small private day school in Frederick Road, kept by the Misses Martin, two Unitarian ladies of considerable culture, with whom she remained until the age of 16 or 17 years, about which period her intellect began to make rapid progress. Mrs. F. T. S. Houghton, a life-long friend and schoolfellow, to whom I am greatly indebted, thus writes to me of these days:—"The teaching was thorough as far as it went, but entirely lacking in incentives to mental effort. There were no examinations and little competition, so that although in many subjects Miss Naden enjoyed the distinction of a class to herself, her schoolfellows scarcely realised that there was anything remarkable about the quiet unassuming girl who never paraded her talents, and entered with simple enjoyment into all school games and interests. Much time and enthusiasm were given in the school to flower painting, and Miss Naden's first laurels were won in this art, her patient brush producing

the most wonderfully delicate and accurate studies of flowers from the life—[one of these studies, a convolvulus, is preserved by Miss Dodd, another friend of these days, and an examination, which was courteously allowed me, amply confirms the above description]—studies which show little of the freedom and vigour which characterise her treatment of intellectual subjects in later life, but which clearly indicate unusual powers of observation and an infinite capacity for taking pains."

"At one time circumstances threw Miss Naden much into the society of girls younger than herself, and to them she proved a singularly delightful and sympathetic companion. She possessed the fascinating gift of a Princess Scheherazade, or an Andrew Lang, and used day after day to beguile the tedium of the walk to school with marvellous fairy tales, in which fun and fancy, beautiful imaginations, and grotesque impossibilities were skilfully intermingled, and the most delicate consideration shown for youthful tastes and prejudices. For example, her good fairies were invariably lavish of chocolate!"

In searching for the factors other than those just alluded to, which give the bias to her mind in favour of literature, science, and philosophy, one is certainly impressed (first) with the ever-present example of her grandfather, Mr. Woodhill, who was a great book-lover in his retirement, and possessed a somewhat large miscellaneous library, and of whom the writer of these lines entertains many pleasant recollections of "bookish chat" in days gone by. Another friend expresses her belief that Miss Naden "not only read every one of these books, but that she mastered their contents;" (second) with the important influence exercised by her devoted friend and accomplished mentor, Dr. Robert Lewins, whom she first met at Southport in the year 1876. *En passant* it is gratifying to record that this loyal friend has generously promised to found a gold medal, to be called "The Constance Naden Medal," in her honour at the Mason College, and to place a marble bust of her—which promises to be a *chef d'œuvre* of the sculptor, Mr. William Tyler, of Kensington—in the library of that institution. Dr. Lewins also intends shortly to publish a volume containing a selection of Miss Naden's philosophical writings. A third minor factor of influence may have been the late Mr. William Bates, B.A., of the Queen's College, a great bibliophile, who was her instructor in the classics.

But, before all, the primary germs of love of knowledge were indubitably obtained from the grand-parents, whom she

thus recognises in the last lines of the dedicatory sonnet above referred to :—

> " Ye who have watched me from my infant days
> With tenderest love and care, who treasure yet
> Quaint sayings, sketches rude, and childish lays ;
> Accept this wreath, entwined in April hours :
> Yours was the garden where the seed was set,
> To you I dedicate the opening flowers."

The uneventful routine of home life was first broken by a little visit to her old friends and former governesses, the Misses Martin, who had removed to Clifton, and subsequently by an occasional trip to the sea-side. In the summer of 1881, in company with her friend, Miss Ellen Brown, she visited Belgium, went up the Rhine, and through Switzerland, returning home by way of Paris. Her fellow traveller thus writes to me :—" I look back upon the long summer weeks spent in her sweet society as one of the brightest spots in an altogether happy period of my life." In the spring of 1883 she travelled for some months in Italy, in company with Miss Rock, and her letters graphically describe the beauties of the Riviera, Genoa, Rome, Venice, etc.

For some years Miss Naden taught at the Home for Friendless Girls, an institution in which she took much interest.

And now we are approaching the most important epoch in Miss Naden's career. " For a few years," writes the same life-long friend, " after leaving school, Miss Naden led a quiet secluded life, devoting herself to the systematic study of languages, and mastering in turn French, German, Latin, and the elements of Greek. To this period belong the " Songs and Sonnets of Springtime," most of which were composed at odd moments, for Miss Naden believed with Goethe that ' nothing is so precious as time.' "

Another writer in the " Mason College Magazine " states that the charming "Dedication" in the above-mentioned volume " was composed while the poetess was occupied with the domestic mending basket ! "

In the autumn of 1881 she entered as a student of the Mason College, to which noble institution she was indebted for a thoroughly sound scientific training. Of this " momentous event " the life-long friend thus writes :—" Not only did it open out to her immeasurably wider fields of knowledge, but it brought the hitherto solitary student into the midst of a bright, active little intellectual world, and gave her those companionships and interests which were a positive need of her essentially gregarious mind. In this congenial atmosphere

Miss Naden developed like a plant brought out of semi-darkness into sunshine—not so strikingly, perhaps, in intellect as in character. It was at Mason College, in the lively debates of the Union, the pleasant but not always peaceful discussions of the Poesy Club, and the learned disquisitions of the various scientific societies, that Miss Naden first became conscious of the full extent of her powers, and assumed that leadership which was her birthright. When she rose to speak there was always a thrill of expectation; her audience knew that however 'thrashed out' by previous speakers the subject might be, it would exhibit fresh vitality and present a new aspect under her skilful treatment; and the hearts of her opponents sank as they thought of the weak points and hidden sophistries in their arguments. Miss Naden had a terrible sixth sense for such things, and dealt with them with a satire which was playful or severe as occasion demanded. Needless to say that this gift did not tend to make her popular with those in whom *amour propre* was more largely developed than the sense of humour. But if Miss Naden was swift to detect error and absurdity (and perhaps the Union debates afforded exceptional scope for destructive criticism), she was equally prompt to recognise a good point or a fine thought, and gave unstinted honour where honour was due."

It will be fitting in this place to enter a little into detail in explaining another factor—a new environment—which, coming just as it did towards the end of her college career, had some, if not an important influence in the future, on Miss Naden's conceptions of the science of life, and its correlative, the science of society. During the spring of the year 1883 an important departure from its ordinary work was resolved upon by the Birmingham Natural History and Microscopical Society—the oldest existing scientific society in the town. On the requisition of fifteen members, the Council determined to establish a Sociological Section for the study of Mr. Herbert Spencer's system of "Synthetic Philosophy." The project was inaugurated with the hearty approval of Mr. Spencer himself, the first hon. sec. being Mr. Alfred Hayes, M.A., author of that exquisite poem, "The Last Crusade;" and since its establishment nearly the whole of the works of "our great philosopher" have been, as the readers of this journal are aware, subjected to an exhaustive and searching exposition and criticism, in which many of those in the town actively interested in the doctrine of evolution have at times taken part. To this Section, over which the writer of these lines has had the honour of presiding since its formation, Miss Naden was attracted in 1884, and she continued a regular

member until she left Birmingham. At our meetings at the Mason College she was an immense favourite—the *genius loci* in fact—and from the wide range of her knowledge, the lucidity and force of her intellect, and the richness of her illustrations, she never failed when speaking to impress her audience and carry complete conviction. But, although a scientist and a philosopher as well, her womanly grace and her womanly sympathy were always dominant. Even on removal to another home her interest in the Section did not cease, for she specially came down from London twice to take a prominent part in its proceedings, and, as one of the speakers happily remarked at a subsequent meeting, "helped it in crises of its history."

Thoroughly equipped as she had been at the Mason College with a sound knowledge of the sciences—chemistry, physics, botany, zoology, physiology, and geology—with refined literary, artistic, and poetical tastes that were pursued as mere diversion, and following the example of the Master by not striving for the honours of a college degree, her broad sympathies lay beyond the somewhat exclusive work in the domain of the specialist, consequently the first determination of her bias for the philosophy of evolution, as embraced in the "Synthetic Philosophy," was doubtless manifested in her address on "Special Creation and Evolution," delivered before a meeting of the Section, held at the Mason College, January 22nd, 1885. Her second address on "The Data of Ethics" was given before the Section February 22nd, 1887. In the same year, and while still a student of the College, she wrote her brilliant prize essay, "Induction and Deduction," which gained the Heslop gold medal. It was a natural sequence from analysis to synthesis, and these contributions and others were the rich fruits of that determination. In further illustration of this mental attitude it is pleasant to relate, on the authority of her friend Dr. Lewins, an incident of her foreign tour. She told Lord Dufferin, in India, when he complimented her on her poems, that she meant her real mission to be philosophy, "not harsh and crabbed as dull fools suppose, but musical as is Apollo's lute," to which the Governor General replied, "Ah! I am no judge of that."

Ever since her connection with the Section, she brought to bear on her criticism the canons of the "Synthetic Philosophy," which are simply that the laws of evolution affecting inorganic phenomena are common also to organic and superorganic phenomena, and from this standpoint she rightly viewed society as an organism—a vast organism—as regards its genesis and many-phased development.

A sympathetic and valuable memoir of her in "Edgbastonia," for February, 1890, by her friend and former teacher, Professor Lapworth, LL.D., F.R.S., justly states:—"She had a habit of referring everything to first principles, and of utterly ignoring the views of the authoritative specialists. Intensely sympathetic as was her mind for what was novel, wonderful, or strange, it was impatient of everything that was dogmatic or authoritative. The chief enquiry was always not 'What do the specialists say?' but, 'Is it true, and why?'"

Her own practical estimate of her philosophy is thus aptly described in a letter to a friend, quoted in an interesting biography, in the "Mason College Magazine" for February, 1890:—"My 'philosophy' is to get all the good out of life that it will give, under all circumstances, which involves making the best of trouble, and bearing it so as to gain moral strength; and even if we can't always live up to this ideal, it is good to keep it in sight."

In all, Miss Naden delivered a series of three addresses or lectures on the doctrine of evolution before the Section, namely, "Special Creation and Evolution," "The Data of Ethics" (previously mentioned), and "The Principles of Sociology" (the last of which, recently published in the "Midland Naturalist," has mournful memories connected with it, and will be presently referred to), which constitute, in an essential form, much of the pith and marrow of the five great divisions of the "Synthetic Philosophy," as originally grouped by Mr. Spencer in his Prospectus of June 5, 1862, and to which he has systematically adhered ever since. As a matter of fact, these addresses were not delivered in consecutive order. That on "The Data of Ethics" should, of course, have come last; but this is of little moment. Combined, they form a miniature synthetic trilogy, which presents many of the main features of the evolution philosophy, and which may be read with equal profit and advantage, either by the tyro or by the advanced student. Speaking generally, they express the highest truth developed by Mr. Spencer's system, that "evolution can end only in the establishment of the greatest perfection and the most complete happiness." The attention of Mr. Spencer was directed to these papers, in which he took much interest, and frequently expressed his approval of them. They were reprinted by the Section, and well circulated among students of the doctrine of evolution.

Miss Naden was a prolific prose writer in other departments, and as she sometimes wrote under her full name, and

oftener by modestly abbreviated initials (C. N. only) and sometimes under the *nom de plume* of "Constance Arden," or the initials (C. A.), it is not an easy matter to compile a bibliography, but among philosophical and other contributions, the following may be mentioned, viz.:—In the *Journal of Science* "Hylozoism v. Animism," 1881 (C. N.); "The Identity of Vital and Cosmical Energy" (C. N.); and "The Philosophy of Thomas Carlyle (Constance Arden), 1882; "The Brain Theory of Mind and Matter" (Constance Arden); and "Paracelsus" (Constance C. W. Naden), 1883; "Hylo-idealism" (C.A.); and "Hylo-idealism: a Defence" (C.N.); 1884; in *Knowledge*:—"The Sentient World" (C. N.); "Hylo-idealism: Does a Universe Exist Exterior to Ourselves?" (C. N.); "Are Tripe and Onions Objective or Subjective?" (A reply, C. N.); "The Evolution of the Sense of Beauty" (Constance C. W. Naden); "Conceptions and Images" (C. N.); "Idealism" (C. N.); "The Weak Point of Darwinism" (Constance C. W. Naden), 1885; in the *Agnostic Annual*, "Pessimism and Physiology," 1885; and "Are Miracles Credible?" 1890. So far back as 1883 she published, under initials (C. N.), a pamphlet "What is Religion?" a vindication of freethought; and in 1887, also under initials (C. N.), a preface to a series of letters in a pamphlet by her friend Dr. Lewins, entitled "Hylo-idealism, the creed of the coming day." Writing to a friend subsequently on the subject of orthodox belief, she says:—"The religion of the future will be a more vivid feeling of life—not of one's own life, but of life in general—a sort of extended sympathy. So that we shall shrink from doing anything that is against the general laws of happiness, even when it seems to make for our own happiness. At least, that is the ideal which seems to me the true one." An elaborate paper by her, on "Volition," was read at the meeting of the Mason College Physiological Society, February 8, 1887, and appears in Vol. XI. of the "Midland Naturalist," 1888. Referring to this paper, she wrote to a friend:—"It was very dry, I believe. Several people spoke afterwards to the effect that they had profited extremely, but hadn't understood a word." In the "Scottish Art Review" for April, 1887, there appeared an interesting review by her of Mr. Robert Buchanan's epic poem, "The City of Dreams." Space only permits the bare mention of these numerous articles to indicate the depth, the boldness, and the versatility of her talent.

It may be mentioned, for the encouragement of future authors, that the first prose essay which our authoress sent to a publisher was rejected!

Miss Naden was a member of the Ladies' Debating Society in Birmingham, and succeeded Mrs. R. W. Dale and Mrs. Crosskey as president. Her address for the session 1882-3—a most finished performance—is founded on a belief that "the watchword of the coming day is Unity, built up from Diversity," and thus concludes :—"Every utterance of a true and lofty idea, in word or deed, helps to render possible a new heroic age—an age which shall find its chief glory, not in commerce or manufactures, not in discoveries and inventions, but in a life moulded to that higher expediency, which we call Truth and Justice, instead of the lower expediency, which may take the shape of Justice or Injustice, Truth or Falsehood."

Miss Naden published two volumes of poems. The first of these "Songs and Sonnets of Spring Time," 1881, contains beautiful specimens of the "opening flowers" which subsequently developed into rich fruit. Next to the "Dedication," which has been previously referred to, the masterpiece is undoubtedly "The Pantheist's Song of Immortality," described by Mr. Gladstone as "a short but singularly powerful production." The charming little poem, "Six Years Old," indicates her early and remarkable powers of observation. Her second volume, "A Modern Apostle, The Elixir of Life, The Story of Clarice, and other Poems," 1887, unmistakably shows an advance on her earlier publication, influenced, no doubt, by her studies in evolution, and especially in psychology. As regards the "Evolutional Erotics"—one of the divisions of the book—we must go to Dr. Wendell Holmes if we want finer expositions of the marvellous blending of science with poetry than those gems which Miss Naden here presents. One of them "Solomon redivivus," 1886, which illustrates the development of life "from Darwin and from Buddh," astonished us by the remarkable spontaneity of her genius. At one of our sectional meetings the subject had been discussed in the evening, and the next morning the President received a copy of this poem by post. Those who were present at a social gathering of the Section held in the autumn of the same year at Handsworth Wood, will not easily forget the bright and playful humour with which she recited "Scientific Wooing," another poem in the same series. On its publication the author of this memoir sent a short critical notice of this beautiful volume to the "Midland Naturalist" for July, 1887, and he treasures among other relics of his beloved friend the following appreciative acknowledgment, which it is most interesting to record as showing her feelings generally towards her Birmingham friends :—

Pakenham House, Edgbaston, June 29th, 1887.

Dear Mr. Hughes,

Thank you very much for your kind review of my book. It is much more than kind, because it emphasises those aspects of my writing which I have more especially at heart.

Thank you also for your sympathy. I can scarcely as yet realise all that this loss means to me.* I shall travel for some time, and finally settle in London; but I do not mean to let this change of abode sever any of my old friendships and interests. I shall always feel grateful to the Sociological Section and to its President.

With very kind regards to Mrs. Hughes and to yourself,

Believe me, yours sincerely,

CONSTANCE C. W. NADEN.

*The loss alluded to was the death of her grandmother, Mrs. J. C. Woodhill, June 21st, 1887. Her grandfather died December 27th, 1881.—W. R. H.

Both books contain a few translations from the German and Italian, the most noteworthy of which are the "Fragments from Faust," in her second volume.

The *Birmingham Weekly Mercury* for January 25th, 1890, printed some unpublished verses of Miss Naden's, entitled "Night" and "Morning," from a MS. collection entitled "Songs of the Heart and Mind," written eleven years ago, when the authoress was scarcely twenty-one.

In a survey of the "British Poetry of the Nineteenth Century," published in the second number of *The Speaker* for January 11, 1890, that distinguished critic the Right Hon. Mr. Gladstone, M.P., places the name of Miss Naden seventh in a list of eight leading poetesses having claims to high distinction, Mrs. Barrett Browning being placed first, while he denies the title of "Poet" to George Eliot, to Mrs. Hemans, Joanna Baillie, and indeed all prior to Mrs. Browning, and thus concludes a very comprehensive article:—"Upon the whole it may perhaps be allowable to say not only that the British poetesses of the last sixty years have developed in numerous instances splendid powers, but even that they are as a whole without a parallel in literary history." It is a very high compliment coming from such an authority, but from subsequent evidence it is probable that Mr. Gladstone had not had under his notice Miss Naden's second volume, which, as before stated, is a marked advance on her first publication. She ceased to write poems in 1887, but, after all, poetry was mere amusement to her, for she had, as we know, deeper and more exalted work for her intellectual powers.

(*To be concluded.*)

SOME NOTES UPON A PROPOSED PHOTOGRAPHIC SURVEY OF WARWICKSHIRE.

BY W. JEROME HARRISON, F.G.S.,

VICE-PRESIDENT OF THE BIRMINGHAM PHOTOGRAPHIC SOCIETY; AUTHOR OF THE "HISTORY OF PHOTOGRAPHY;" "PHOTOGRAPHY FOR ALL," ETC.

(Concluded from page 70.)

Documents, etc., Copied by Photography. — We must photograph not only places, but things. Old documents, seals, plans, maps, various objects of antiquity, rare fossils, etc. All these will provide food for the camera, and will add interesting pictures to our stock. One advantage of photography in this direction is that it enables us to *bring together*, for purposes of comparison, a series of objects which may be scattered in many collections. The facsimiles of documents, etc., obtained by photographic processes, are far more valuable than copies by hand can be, since they must be literal and unbiassed; errors in copying are avoided, and the evidence of the photograph is practically as good (sometimes, indeed, it is better, because clearer) as that of the original.

Size of Photographs to be taken.—I fear it will be impossible to bind ourselves down to any definite size of negative. Perhaps it would be best to make the whole-plate size (8½in. by 6½in.) our standard. By the recent substitution of celluloid films for glass plates, the weight of the photographer's equipment has been greatly diminished; so that a whole-plate camera with films, weighs no more than a half-plate camera with glass plates.

By the use of cases or boxes to hold separately mounted prints, the difficulty of variety of sizes is largely avoided. If albums are made up, they could be of such a size as to hold one whole-plate print, or two half-plates, on each page.

For hand-camera work the usual size is the quarter-plate (4¼in. by 3¼in.); and for pictures of this size separate albums might be provided, or they might be mounted four on a page of the larger albums. It must be remembered, however, that it is easy to enlarge or reduce negatives, so that they could all be brought to one uniform size if that were thought desirable. Or it is even easier to enlarge or reduce the prints as they are made from the negatives, if we use bromide-paper, etc., for printing upon.

How other Societies (Literary, Artistic, and Scientific) can Aid in the Work of the County Photographic Survey.—I trust that it may be assumed that the three photographic societies already in existence in Warwickshire, viz., the

Birmingham Photographic Society—Hon. Secs., Mr. J. H. Pickard, 361, Moseley Road, Birmingham, and Mr. A. J. Leeson, 20, Cannon Street, Birmingham;

Leamington Amateur Photographic Society—Hon. Sec., Mr. F. M. Gowan, 20, Beauchamp Square, Leamington;

Coventry and Midland Photographic Society—Hon. Sec., Mr. F. W. Dew, The City Studio, Coventry;

will do all they can for the work of a photo-survey; but very valuable assistance can be rendered by several other societies within the county, whose aim is the furtherance of Literature, Science, and Art.

Among these I may name—

The Vesey Club, Sutton Coldfield.—Hon. Sec., Mr. C. F. Marston.

The Archæological Section of the Birmingham and Midland Institute.—Secretary of the Section, Mr. Jethro A. Cossins, Colmore Row.

The Birmingham Natural History and Microscopical Society.—Hon. Secs., Mr. W. H. Wilkinson and Mr. W. P. Marshall, M.I.C.E., The Mason College.

The Birmingham Philosophical Society (1876).—Hon. Secs., Professor J. H. Poynting, F.R.S., 11, St. Augustine's Road, Edgbaston; and Mr. C. A. Davison, M.A., King Edward's High School, New Street.

The Birmingham and Midland Institute Scientific Society.—Hon. Sec., Mr. W. E. Weaver, 221, Broad Street. This Society has a Photographic Section.

Birmingham Microscopists' and Naturalists' Union (1880).—Hon. Secs., Messrs. Collins and White, Broad Street Corner.

Birmingham Architectural Association (1873).—Hon. Sec., Mr. H. R. Lloyd, A.R.I.B.A., 26, Corporation Street.

Birmingham School Natural History Society, King Edward's High School, New Street.

Birmingham Botanical and Horticultural Society, Botanical Gardens, Edgbaston.—Curator, Mr. W. B. Latham.

Warwickshire Field Club (1858).—President, the Rev. P. B. Brodie, M.A., F.G.S., Rowington Vicarage; Head Quarters, The Museum, Warwick.

Tamworth Natural History, Geological, and Antiquarian Society.

Royal (Birmingham) Society of Artists, New Street.—Secretary, Mr. Jonathan Pratt.

Kyrle Society.—Hon. Sec., Miss Gittins, 87, Hagley Road.

Association for the Preservation of Open Spaces and Public Footpaths.—Hon. Sec., Mr. Grosvenor Lee, 18, Newhall Street.

Art Circle.—Hon. Sec., Mr. E. Chamberlain, Burlington Chambers, New Street.

The Midland Arts Club.—Hon. Sec., Mr. W. H. Vernon (meetings at Grand Hotel, Colmore Row).

Municipal School of Art, Edmund Street.—Head Master, Mr. E. R. Taylor; Secretary, Mr. E. Preston Hytch.

How Antiquarians, Scientists, etc., can Aid in the Work of a County Photographic Survey.—Now, although we photographers may know *how* to photograph, we do not always know *what* to photograph. We want the historian and the antiquary, the literary man, the artist, and the scientist, to aid us in this. We want these students of the past and the present to draw up lists of places and objects in each square of our map which they consider ought to be recorded; and we want them to tell us all about them, so that the pictures we secure may be of interest to us as well as to them.

Assistance from Landowners, Residents, etc.—The nature of our work ought to secure aid and assistance from occupiers in all parts of the county. Armed with an introduction, stating the object and plan of this survey, the photographer may hope to be afforded facilities for his work which he would otherwise scarcely venture to ask for. Those who occupy historically interesting or beautifully situated places, will certainly be willing to aid in such a task, which may really be called national; while to the guardians of our churches—the clergy—our scheme should appeal with special interest.

Required Funds to be Obtained by Subscriptions and Grants.—In the work here proposed it is thought that all the workers will be willing to help, not only by paying their own travelling expenses, purchase of dry-plates on which to

make negatives, use of apparatus, etc., but also by subscribing to raise the funds which will be necessary for the purchase of maps, albums, cases, etc., and the defraying of the cost of printing in platinotype, etc., and making lantern slides.

It does not seem unreasonable, however, to ask for subscriptions from all who are interested in such a survey. Our own Society will, it may be hoped, make a grant in aid ; and, doubtless, if a portion of the work is done as a sample, and well done, assistance will not be wanting.

THE END OF A PHOTOGRAPHIC SURVEY.—In the way of work to be done, there could be no end. Every day sees some change, something of the old order is blotted out, something new is introduced. A railway is made across our pet landscape, and we must photograph the trail of black smoke from the engine, if it be only to send the picture to Mr. Ruskin. How rapidly the features of our towns are changing must be obvious to the most careless observer ; and anyone who has been absent from the new city for but a few years has good cause to sing the old song, "I can't find Birmingham !"

But the term "end" may also be considered in the sense of "object." What shall be done with our photographs when we get them ? Well, this Society should retain at least two complete sets—a working set and one for reference. Complete sets ought also to be prepared for our Municipal Reference Library, for the British Museum, and for any other public institutions who desired a set and were willing to pay for it.

Our schools would value highly a selection of large photographs ; and enlargements might be made for this and other special objects, as for exhibition on the walls of our free libraries, for teaching and for lecturing purposes, etc.

Further, it appears to me that the pursuance of a task such as I have attempted to sketch out, would unite the members of this Society as only men are united who have a definite object in view, and who work for a common end. It would attract, it may be hoped, new workers to join our ranks ; and would add to the status of the Society in the eyes of the public. Much energy which is now frittered away would be diverted into a useful channel ; and although it may be said that the main benefits of our work will be reaped by a posterity "which has never done anything for us," yet I feel confident that we shall derive as much pleasure from *doing* the work, as our descendants will from its *study* and *examination*.

OCEANIC ISLANDS:

SOME ACCOUNT OF THE PROBLEMS PRESENTED BY THE STRUCTURE AND NATURAL HISTORY OF ISLANDS NOT IMMEDIATELY ADJACENT TO ANY CONTINENT.*

BY REV. T. S. LEA, M.A.

An oceanic island may be defined as above, to the exclusion of all islands accidentally severed from a neighbouring continent by narrow and shallow seas. Of the latter class the British Islands are a good example, as there is no great depth of water in the Straits of Dover, and no break in the geological formation. Moreover, when the natural history of Britain is compared with that of the rest of Europe, it is found that there are scarcely more than two plants and a very few insects which are not also to be found in some part of the Continent. The general facies of the flora and fauna on both sides of the Channel is identical.

On the other hand, when such islands as the Canaries or Madeira come to be investigated, they are found to differ from Great Britain in both those respects. Their geology is not the same as that of the continent of Africa, and their flora and fauna are to a large extent peculiar.

In the present state of geological investigation it seems probable that the main oceanic areas have been practically permanent throughout the world's history. There are distinct arguments against any such theory as that which the story of Atlantis has suggested, that a great continent has subsided within times known to man. One of these arguments is the structure of such islands as those which will be chiefly mentioned in this paper.

The oceanic islands of the world group themselves under two main divisions—coral islands and volcanic islands. Dismissing the former as being a subject in themselves for separate investigation, but referring in passing to Barbados as an instance of how change of level from geological causes may give some of these a greater elevation than that of a mere atoll, I may proceed at once to the volcanic islands. These may be found in all parts of the ocean. A chain of them passes down the Atlantic basin, and several important instances lie in the Pacific. The most prominent example is, perhaps, the Hawaiian group, for there the process both of construction and subsequent denudation is going on before

*Read before the Birmingham Natural History and Microscopical Society, May 7th, 1889.

our eyes. The island of Hawaii is nearly one hundred miles in diameter, and contains the bulkiest, if not the loftiest, volcano in the world. The two masses of Mauna Loa and Mauna Kea, with the subsidiary height of Hualalai and the crater of Kilauea, form a mass of black lava rock. rising by an extremely gradual slope to a height of over 13,000 feet above the sea; while the foundations below the sea level are correspondingly great, as that portion of the Pacific is one of the deepest areas. A chain of islands stretches away to the north-west, all mountainous, but exhibiting more traces of denudation the greater their distance from the present seat of activity in Hawaii. The action of the Hawaiian volcanoes, though not absolutely regular, is constant and invariable on the whole. At intervals an eruption occurs, never of stones or ash, but always of very hot fluid lava, which rushes down the side of the mountain to the sea, and leaves a permanent addition to the island. After a comparatively brief period this lava has sufficiently decomposed on the surface to allow of the spreading of the forest, and thus the lava streams are successively obliterated, and the general aspect of the island remains unchanged. When the period of activity has ceased, as it has in the other islands of the group, the scenery is broken by picturesque precipices and jagged hills, on which the forest flourishes undisturbed. It thus appears that the Hawaiian Archipelago is the result of an indefinitely vast succession of ejections of lava from a vent in the floor of the Pacific, and there is no indication of any junction with either Asia or California. Nor, from the appearance of the plants, would any such connection appear to have been possible; and this brings me to the second portion of the subject.

Up to this point I have indicated some of the phenomena which have led up to the induction that the origin of these volcanic islands may be assumed to be entirely sub-oceanic, and that no other hypothesis is either needed or admissible.

I now pass on to show that this hypothesis receives a very remarkable confirmation from the plants and animals found on such islands, and also that it helps us very considerably in solving the problems of geographical distribution and its history in the geological part. Leaving Hawaii for the moment I must give you a brief account of some circumstances connected with another island. Just off Cape San Roque at the extreme eastern point of South America, about 120 miles from the coast and a day's voyage from Pernambuco, there lies the rocky islet of Fernando de Noronha. This little spot—it is not more than seven miles long by two

miles wide—has its history first as a Dutch naval station, then as a depôt for privateers, and lastly and to this day as a convict station for Brazil. It has, therefore, been somewhat difficult of access, both Mr. Darwin and the "Challenger" having been refused permission to collect specimens there. It was, however, visited in 1887 by Mr. H. N. Ridley, M.A., F.L.S., then of the British Museum, and now of the Botanical Gardens, Singapore, with whom were Mr. G. A. Ramage, of Edinburgh University, and myself. We stayed there six weeks, and the results of our work will shortly be published by the Linnean Society, the specimens being lodged in the British Museum. It is thus that most of my observations on this subject were made at Fernando de Noronha, though the problem is the same in the Hawaiian Islands as there. Like the Hawaiian Islands, Fernando is volcanic, but its age is very great, and there are no traces of any recent activity. And thus while I chose the former as an example of the construction of an oceanic island, I shall take the latter as an illustration of the present condition, and as also indicating the future of such places; though what I shall say of it is true also, within certain limits, of Hawaii, and even of New Zealand and Australia. Taking the flora and fauna of Fernando de Noronha as they stand at present, the species may be divided into two classes, the adventitious and the indigenous. The adventitious species may be again subdivided into those which have been intentionally and those which have been accidentally introduced by man from elsewhere. Intentional introductions, such as fruits, vegetables, etc., may be dismissed, but the accidental are more important. Nobody purposely introduces rats and weeds to any new place, but the rats and weeds find their way of themselves, and have a great habit of making themselves at home. In so doing they bring about very considerable changes, as I shall indicate. The other species which I classed as the indigenous ones may be grouped under three heads. First, the creatures of the shallow water near the shore. These are as much confined by deep water to their particular location as the land species; or, to explain by an instance, a worm which inhabits rocks is not adapted for an ocean voyage. Thus though there was little absolutely peculiar to the Fernando coast it was noticed that the general aspect was much more that of West Indian waters than that of the much nearer Brazilian coast. Secondly, just out of reach of the waves grew many land plants, of which Ipomœa Pes-capræ, a splendid crimson convolvulus, may serve as a type. These are plants whose seeds being numerous and not liable to damage by sea water may be

presumed to be so spread, at any rate these plants are found on most tropical shores. Thirdly, on the island itself there are, where they have not been displaced by the weeds, the regular ancient vegetation of the island, and such birds, reptiles, and insects as belong to it. I do not assert that it is always possible to say for certain into which class a particular species is to be placed, except in the case of those which are found on Fernando de Noronha, and nowhere else in the world. Of such it is quite safe to assume that they are entirely indigenous. Some approximate figures --I cannot yet give them with any accuracy—may possibly render what I have to say more clear. Of animals, of all orders and species from the turtle to the mosquito, which inhabit the island and neighbouring waters there are about 250 kinds only, and of this small number at least thirty are peculiar to the island. And these include two birds, a lizard, and a snake. Of plants the same can be said, as the whole number, including every vegetable grown in a garden, does not reach 300, and of these some 22 are not found elsewhere. And the same is true of all such islands. A very large proportion of its indigenous fauna and flora is peculiar to each island. The great tortoises are peculiar to the Galapagos Archipelago, several trees to the Canaries, while forests of endemic trees in St. Helena have been exterminated by the ravages of goats.

For thus it is that when man arrives he brings with him vermin of all orders, and the ancient things disappear before the invasion. This is happening ruthlessly in Fernando de Noronha, where great trailing leguminosæ smother the native bushes wherever cultivation has not extirpated them, or, as in the case of the forests, the axe has spared a few trees. Some, it is true, will hold their ground, but only in such rocky places as are too barren even to grow pumpkins.

But let me suppose that we visit such an island in the first ship that touches there. Let us banish the thought of the weeds and devote ourselves to the problen how, when the eruption that first reared the island above the waves had subsided, the population arrived. The ferns which form so large a part of the Hawaiian vegetation are easily accounted for. They are plants with very minute spores, and may have arrived by wind, and found a congenial home. Fernando was not congenial. There is only one fern there, and its tenure of life seems ever precarious. Some of the ferns peculiar to Hawaii may have been common elsewhere at one time but subsequently have become extinct. This must remain conjecture into which I now must plunge you.

Several theories may be tenable :—First, that we have small colonies of refugees from floras and faunas now extinct or modified in their original abode. Second, that arrivals at an island have undergone modification to suit their new surroundings on arrival there. Third, that both these causes might have operated together.

Probably the last is the truest, but much may be learned if care is taken tc ascertain where the nearest relations to the existing forms may be found.

This is as far as my ignorance will allow me to go. I can only indicate one other subject which plunges me yet deeper into speculation.

Why are these oceanic forms so weak ? Why do they not hold their own against the invaders? Why must the Hawaiians fall a prey to leprosy? Why must the Tasmanians and Maories dwindle ? The answer appears to be that the continental forms are strong because they have had to struggle against adversity. The toughest weed in England is the plantain (*Plantago major*), and the plantain is tough because it has learned to endure trampling. A plant of the same genus in the Hawaiian Islands has a stem some inches high—a fatal error which our plaintains have learned to avoid, This is an intelligible instance, but others are less so. It seems as if the oceanic species had grown up in security and weakness—if I may use a strange term, psychic weakness—weakness of that soul which governs the lower functions of growth and nutrition, and develops in animals into desire and will.

That many of the islanders in New Zealand and Hawaii were amenable to witchcraft, and died under the spells of their prophets, is a scientific fact, based on sound evidence. That a weak-willed race, as this hypothesis suggests, should fall beneath a stronger one is not much to be wondered at; and perhaps in lesser degree this may hold good in lower orders of nature. The study of such a contest may enable us to form correct views of the nature of forces ever present indeed, but for the most part rendered imperceptible because usually in equilibrium.

DR. COLLIER'S OBJECTIONS TO WEISMANN'S THEORY OF HEREDITY.

It certainly would seem a serious objection to any scientific theory that the views held by the bulk of the medical profession were opposed to it. But "views" may be resolved

into facts and interpretation of facts, and the class of facts brought forward by Dr. Collier are certainly not opposed to Weismann's theory. Dr. Collier has missed a vital point in that theory by neglecting to analyse the concept "acquired character." In the production of an acquired character there are two sets of forces at work—the action of the environment (in the case of diseases—virus, bacillus, bad habit, climatic condition), and the constitution. What Weismann holds is that the constitutional part, like any other organic character, may be transmitted and inherited. The part due to the direct action of the environment is not inherited. As an acquired character is due to two factors—one inherited and one not—an acquired character is not inherited. In the case of one individual, the pleasures of the table give rise to that condition of the liver which Dr. Collier says causes the symptoms of gout; in another man they will cause an apoplectic habit of body; in a third an iron constitution will resist any excesses. Similarly the action of so specific a virus as the virus of syphilis or of small-pox acts very differently on different constitutions. It is the tendency to be influenced in the same way by the same outer causes that is transmitted or inherited. And it is this descent of constitution that causes the family histories of gout or of hæmophilia. That a constitutional disposition and not an acquired effect is transmitted is specially clear in the case of bleeders. For them the scratch or pulling of the tooth is quite out of proportion to the resulting bleeding. The absence of exciting cause, the peculiar dormant transition through the females, are clear indices of the constitutional and hence inheritable nature of the affection.

In the case of consumption, it is clear that a child, with both parents consumptive, would have the greatest possible chance of inheriting a constitution unable to resist the organism associated with the disease. It must, however, be noted that direct infection is a large factor in family diseases, and hence in medical statistics.

The virus of a disease, or the specific germ, may pass with the reproductive cells from either parent to the embryo; they can hardly escape passing from mother to developing embryo. The extreme case of risk of direct infection is reached when a child is born of consumptive parents. Even if it inherit from a remoter ancestor unusual constitutional resistance to phthisis, from its conception till it leaves the parental roof it is in an environment impregnated with the bacillus of consumption.

I think I have said enough to show that family histories of disease need much more careful analysis than Dr. Collier has attempted before they can have any bearing in favour of or against Weismann's theory.

Finally, Dr. Collier admits that the bulk of the profession no longer believe that scars, mutilations, and so forth, are transmitted. But it is surely illogical in the extreme to hold that while the obvious structural changes of a scar are not transmitted, the subtler or minuter changes produced in the lung by the consumptive organism, or in the liver in the case of gout, are inherited.

P. CHALMERS MITCHELL.

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Museum, Oxford.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—BIOLOGICAL SECTION.—March 11th. Mr. W. B. Grove, M.A., in the chair. Mr. J. Edmonds exhibited *Torrubia Robertsii*, "The Bulrush Caterpillar," from New Zealand (native name Awhetu), brought over by Mr. S. A. Daniell, of Moseley. Mr. J. E. Bagnall, *Serratula tinctoria* and *Littorella lacustris*, both new to Sutton Park; for Mr. J. B. Stone, *Arctostaphylos alpina*, *A. ursi*, *Phyllodoce taxifolia*, and other plants from Norway; also for Miss Gingell, *Peltigera rufescens*, *P. canina*, *Solorina saccata*, *Cetraria aculeata* and other lichens from Dursley, Gloucestershire; and Mr. A. H. Martineau, nest of *Vespa sylvestris*.—GEOLOGICAL SECTION. March 18th. Mr. T. H. Waller, B.A., B.Sc., in the chair. A paper on "Norway and the North Cape" was read by Mr. W. P. Marshall, M.I.C.E., and illustrated by the oxy-hydrogen lantern by Mr. Charles Pumphrey. There was a very large attendance, the accommodation of the Examination Hall, Mason College, being taxed to the uttermost. A hearty vote of thanks was given to Messrs. Marshall and Pumphrey.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—February 24th. Mr. H. Hawkes exhibited peristome of *Polytrichum undulatum;* Mr. G. H. Corbett, pebbles from the Bunter bed, containing worm tracks, tails of trilobites, &c. A paper was then read by Mr. J. W. Dunn, on "Volcanoes." The writer referred to the ancient traditions and superstitions concerning volcanoes, and said they were generally regarded from a destructive point of view, but they had also a beneficent side. The phenomena of volcanic action were described, and the theory of absorption by the incandescent rock masses enlarged upon. The fact of volcanoes nearly always occupying rising areas proved their use as elevating forces. A discussion on the subject closed the meeting.—March 3rd. Professor Hillhouse, M.A., F.L.S., in the chair. Mr. J. Collins exhibited a collection of dried plants belonging to the orders Leguminosæ and Rosaceæ; Mr. J. Rodgers, slab of shale from Hamstead, with impression of Lepidostrobus, &c.; Mr. Round, scales of ganoid fish from the coal measures.—March 10th. Mr. H. Hawkes showed an abnormal growth of daffodil,

the corolla and perianth being on one side; Mr. Cracroft, modified quartz from the Crystal Mountains, America. Mr. T. H. Waller, B.A., B.Sc., then gave a lecture on "The Story of a Pebble." The lecturer said the difficulty of the subject was to tell where to begin. If we visited the gravel pit in Sutton Park we should find the stones, when touched with the hammer, very friable. The cracks all start from the point where they touch some other stone, and are vertical. Some local and exceptional cause brought this about, possibly the faulting we find in the neighbourhood. We shall also find among the stones some cavities containing casts of stalks of Encrinites, showing that pebbles of mountain limestone had been dissolved by the action of rainwater. If we look over the loose stones we shall find pebbles of quartz, porphyry, tourmaline, and perhaps a few of granite, though these are rare, and no end of quartzites. They all give evidence of rapid water action, and were possibly brought by a great river from the north. Such deposits are now being formed in the Himalayan district of India. The lecturer described the mountains from which these fragments were possibly torn, ground down to sand, and cemented together again by a solution of silica which it was not difficult to account for. When the sand grains were well rounded the rocks contained many enclosures. The lecturer concluded by wondering whether our island would be elevated in the future to join the Continent, or depressed until the mountain tops alone were visible. The lecture was illustrated by a series of rock sections under the microscopes.—March 17th. Cryptogamic Botany. Mr. H. Hawkes exhibited a collection of British ferns, also a collection made by Dr. Arnold about fifty years ago; Mr. J. Collins, a collection of Belgian mosses, most of the species are found in England, though some are very rare; Mr. G. Corbett, lignite from Brook Point. Under the microscopes, Mr. Hawkes exhibited a set of twelve slides showing the structure and form of Æcidia; Mr. J. W. Neville, *Hydrodictyon utriculatum*, in four stages of growth.

OXFORD NATURAL HISTORY SOCIETY.—February 25th. Professor Green in the chair. In the absence of Dr. Murray, who, owing to recent illness and pressure of work, was unable to deliver his proposed lecture, Mr. Ryman Hall kindly exhibited, by oxy-hydrogen light, and explained a series of photographic slides of the Falls of Niagara, most of them taken in winter, and showing beautiful effects of the action of frost on the spray of the falls. He also illustrated with diagrams and actual photographs the construction of the Forth Bridge. Mr. H. M. J. Underhill commenced a series of interesting illustrations of the process of preparing lantern slides of microscopic objects; but the demonstration was unfortunately cut short by the failure of the gas. They will be resumed, it is hoped, on a future occasion. Mr. Druce showed specimens of a new variety of Agrostis, *A. canina*, var. *scotica*, from Ben Eay, which had been at first supposed by him to be the Scandinavian form *Agrostis rubra*. Mr. Druce expressed a hope that the true rubra might hereafter be found in Britain.—March 11th. Professor Green in the chair. Professor S. Vines delivered a lecture on "Some Adaptations of Plants for the Preservation of Chlorophyll." This was in continuation of a previous lecture on the action of chlorophyll, by the absorption of light, in assisting the nutrition of plants. The lecturer first pointed out how the aim of the plant was so to use its chlorophyll as to get the greatest amount of advantage out of it, without undue waste by oxidation. This economy is aided by adaptation in two different directions: first, in the actual

structure of the green parts; secondly, in the position of these parts. The leaves of plants have ordinarily one surface facing upwards to the sky, the other downwards to the earth. In this position (diaheliotropic) the upper side receives far the greater amount of light, and, to guard against waste of chlorophyll, a special structure (palisade tissue), consisting of elongated upright cells, is found on the upper surface. In these cells the chloroplastids, being discoidal, and not spherical, in form, imbedded, as they are, in protoplasm irritable under strong light, can be so turned as to expose only their edges to direct rays, which they could not be in the ordinary shaped cells of the lower side of the leaf. In shade-growing plants, such as ferns, these special cells are entirely absent, both surfaces of the leaf being composed of similarly formed cells. Again, by the motion of growth, plants have the power of placing their leaves in the position best adapted to receive such amount of light, neither more nor less, as will ensure the best economy of their chlorophyll. For instance, observe plants growing in a crowded hedge—stems are curved, positions of leaves altered so as to get the best light for that particular plant—a manifestation of heliotropic irritability. In plants growing in exposed situations, under an extremely powerful sun, the exposure of the full surface to the direct rays would occasion a far too wasteful expenditure of the precious chlorophyll. Hence in these a different position (which may be called paraheliotropic) is often found, in which the edges of the leaves, and not the two surfaces, face directly up and down. A good instance of this is shown by the Eucalyptus (Australian Blue Gum), in which the leaves of the lower branches, growing under the shade of the surrounding forest, and therefore in a modified light, are horizontal (diaheliotropic), while the upper branches, towering aloft in the full blaze of the sunlight, are all turned edgeways to the zenith (paraheliotropic), and so only catch the slanting rays at morning and evening. This explains the strange phenomenon of the so-called compass plants, whose habit of growth is such that they so twist themselves to expose only the edges of their leaves to the direct light, that these edges always lie north and south in the meridian of the place where they grow, while the exposure of the sides is due east and west, by the knowledge of which fact the cunning botanist may steer an accurate course. These, when the growth of the leaf ceases, have attained their "fixed light position," as it is called. But there are other plants which can alter the position of their fully developed leaves at any time, according to the varying conditions of the light—bright, dull, day, or night. (Growing specimens of several of these were shown, Oxalis, Acacia, Bauhinia, folding, drooping, or retracting against each other the edges of the leaves, according to the strength of the light to which they were exposed; and so presenting, according to its conditions, more or less of surface to its direct action.) This has been called, by a poetic figure, the "diurnal sleep" of plants. Many such, for a different reason, droop, contract, &c., at night, in this case to protect themselves, not against undue intensity of light, but against perils of night frost and undue radiation of stored up heat. The general conclusion resulted that each particular plant has become attuned to the particular conditions of intensity of light suited to its natural development, and that neglect of these conditions adds greatly to the difficulty of securing the healthy progress of any plant in new environments. At the conclusion of the meeting, the Society, through the President, offered its hearty congratulations to Mr. M. S. Pembrey, one of its members, on his recent election to a Radcliffe Travelling Fellowship.

CONSTANCE C. W. NADEN:
A MEMOIR.

(*Continued from page 83.*)

PART II.

"O life as futile, then, as frail!
O for thy voice to soothe and bless!
What hope of answer or redress?
Behind the veil, behind the veil."

In Memoriam.

After leaving Birmingham, on the death of her grandmother, from whom she inherited a very handsome fortune, Miss Naden started, September 29th, 1887, with her friend, Mrs. Daniell, for an extended tour, proceeding across Germany and down the Danube, stopping at Vienna, and other interesting places, on the way to Constantinople, where a pause was made; then on to Broussa, Baalbec, Damascus, Palestine, and Cairo. After a trip up the Nile to Assouan, they returned to Cairo, and from thence proceeded to Bombay and Calcutta. The ladies were received with courtesy and hospitality both by Lord Dufferin (the Governor-General) and by Lord and Lady Reay. In a letter to a friend, she says:—"We had a few introductions in Bombay, and I was decidedly amused to find myself plunged into 'the best society,' and meeting the Duchess of Connaught quite informally at a dinner party. She asked me about Mason College, and I had to explain to her the mode of conducting an impromptu debate. Then we were passed on to the Viceroy in Calcutta, and he liked my poems very much, and amused me by saying that he himself 'couldn't write verse, but could do poetical prose very well.'" Professor Max Müller had kindly given them introductions to several of the native pundits, notably to Mr. Malabari, the great Indian reformer of Bombay, who explained his ideas on the necessary social reforms, especially regarding infant marriages, and the marriage of child-widows. These were alluded to in her subsequent address to the Sociological Section, and in the same paper she records with gratification the fact "that Mr. Spencer's works are known and appreciated among the more highly educated of the native gentlemen." In another letter to a friend, she says:—"We went up to a stupid place, called Mount Aboo, for two days, and the Indian demon, fever, kept me a prisoner there for seven weeks." Poor lady! it was the last long holiday she ever took, and, although it must have been eminently rich in experiences, reading between the lines, one sees the beginning of the end. The friends returned to London in June, 1888.

On settling down in town after her Indian tour, she resided in apartments, first at 14, Half Moon Street, afterwards at 19, Old Quebec Street, for a time, and subsequently purchased, in February, 1889, an elegant house, No. 114, Park Street, Grosvenor Square, in the fitting up of which she took much interest, and her affectionate disposition and intellectual power soon attracted a circle of cultured and like-minded friends. Of these days, so full of brightness and hope, she thus writes to a friend:—"I am writing, and buying furniture, and going to lectures, and indulging sometimes in mild dissipation, and learning the value of money—I mean how far it *won't* go—which I never had the slightest idea of before. It is all very interesting." She scarcely does herself justice in this respect, for I am informed that she had the command of other private means in the lifetime of her grandparents, out of which the cost of her publications was defrayed, as well as her expenses of travel. Philosophy still had the greatest fascination for her: she became a member of the Aristotelian Society, and was much valued by her fellow-members, and took an active part in its meetings; indeed, a paper of hers on "Rational and Empirical Ethics" was, since her decease, vicariously read at this Society only a few weeks ago. That she was in her element in this learned Society, and could hold her own, is evidenced by an extract from a letter addressed to me, December 22nd, 1888:—"I had a little discussion with —— [naming a distinguished evolutionist] the other day at the Aristotelian Society, to which I belong, and made him confess that he didn't know his 'Data of Ethics.' The point was, whether Herbert Spencer acknowledges the influence of the religious, as well as of the political and social controls, in the evolution of the moral control." She was also a member of the Royal Institution. In the summer of the following year, writing from Ilkley Wells, where she had gone for rest, she told me that she had written "a reply to Mr. Lilly's libel on Utilitarianism in the 'Fortnightly,'" but from what she said in a subsequent letter, this seems to have been too long for publication. Her main energies, however, were devoted to an important work on "Evolutionary Ethics," the nucleus of which was the short paper read before the Sociological Section on the "Data of Ethics," previously referred to, and on the 20th July last, she thus wrote to me, in reply to a letter:—"My book gets on slowly, but I hope surely. I cannot say when it will be finished, though it won't be a 'mag. op.' at all, for ideas have an uncomfortable habit of developing as one writes, and of requiring alterations in their clothing."

Following a suggestion of Sir Philip Magnus, which appeared in a letter addressed to the *Pall Mall Gazette* of 8th March, 1889, she had it in contemplation to assist as honorary secretary in the foundation of a "Spencerian" or "Evolution Society" in London, the first meetings of which were to be held in her drawing room, and her colleagues were to be Sir Philip Magnus, Dr. Romanes, Professor Rhys Davids, and Mr. Edward Clodd.

The claims of sweet charity—that "voluntaryism," so incessantly urged by Mr. Herbert Spencer, as opposed to the "State aid compulsion," which he everywhere as strongly deprecates—also appealed to her sympathies, and shortly before her death she was, as a member of the Working Ladies' Guild, in correspondence with Lady Mary Feilding (the founder of the guild) with regard to taking the entire charge and responsibility of the Campden Houses, a block of houses on Campden Hill, arranged for the reception of ladies of limited means. In April last she held a drawing room meeting at her house, in aid of the new Hospital for Women in Marylebone Road, at which her friend, Mrs. Garrett Anderson, delivered an address on the subject of the hospital and its relations to the training of medical women for India; and at the close of the meeting several hundred pounds were obtained in aid of the funds. She was most generous in her private charities, and agreed with Mrs. Daniell, one day when they were chatting over the subject, that "she had so many private cases to help that she had little money to subscribe to public charities."

Progress, emancipation, and social reforms naturally had a large share of Miss Naden's active energies. She was a Liberal in politics, and canvassed for Mr. George Leveson Gower when he was an unsuccessful candidate for Marylebone. She was a member of the Denison Club, principally composed of members of the Charity Organisation Society, who met monthly to discuss questions connected with the condition of the poor. She was also a member of the Somerville Club (only for women), and of the National Indian Association. Miss Naden was in favour of the extension of the suffrage to women, and under the auspices of the Women's Liberal Association, recently gave a lecture at Deptford on the subject, which has been described by a contemporary as having been delivered "in that matured and commanding strain of oratory which only the very highest gifts could, at her age, either impart or justify."

Miss Naden's last public appearance in Birmingham was at the Mason College, on Tuesday evening, 22nd October, 1889, on the occasion of the opening meeting for the session

of the Sociological Section, in which she took such deep interest. With her usual generously-altruistic nature, she had some weeks before promptly complied with the request of the President that she would deliver an address as a preliminary to the subsequent exposition by her fellow-members of the first volume of Mr. Herbert Spencer's "Principles of Sociology." The meeting was held in the large Examination Hall of the college, and the attendance, which included many ladies, was numerically and intellectually strong, numbering about a hundred. Among the audience were all the members of the Section, and some of the members of the other sections of the parent Society, a few of her old companions of College days, several of her near relatives and intimate friends, and three or four of the learned professors, her former teachers in the college. Her address was read in a remarkably clear and impressive voice—the intonation being so perfect that it penetrated into every corner of the hall—and was listened to with rapt attention during the period of upwards of an hour which it occupied in delivery. During the pauses, which naturally fell here and there, hearty and sympathetic applause was accorded. Her finely-cut and highly intellectual face never seemed so bright and earnest. Many friends remarked on her apparent good health and spirits, and that all traces of her Indian illness had disappeared. At the conclusion, a cordial vote of thanks to the able Sociologist for her valuable address, accompanied by a request that she would allow it to be printed, was moved by Mr. W. B. Grove, M.A., President of the Society, and seconded by Professor Tilden, D.Sc., F.R.S. In his subsequent remarks, the learned professor paid her the high compliment of saying that she had acted wisely in undertaking original work rather than striving for a degree—a compliment, we believe, that has rarely been paid before, except by Professor Michael Foster in the case of the late F. M. Balfour. Her staunch friend and former teacher, Professor Lapworth, LL.D., F.R.S., J. A. Langford, LL.D. (whose "Century of Birmingham Life" she had referred to in her address), and her old fellow-student, Mr. F. J. Cullis, F.G.S., the first president of the Union Debating Society, also spoke in the warmest terms, and the motion was carried with acclamation.

The address commenced with a plea in favour of the new science of Sociology and a subsequent definition of the nature and scope of its aims and objects, with some account of the various complicated factors which regulate its inter-dependence and progress, together with comparative illustrations from primitive and other races, and, after a

picture of a contrast between the Birmingham of the present day and that of one hundred and forty years ago, thus concluded :—

" A society like ours ought to find its ideal in that ' possible future social type,' which, in Mr. Spencer's words, ' will use the products of industry neither for maintaining a militant organisation nor exclusively for material aggrandisement, but will devote them to the carrying on of higher activities —a type which, instead of believing that ' life is for work,' will hold the inverse belief that ' work is for life.' " These were the impressive last words spoken in public by Constance Naden.

It was a distinct triumph both for the author and the cause, and the memory of the meeting will for ever be treasured by those who had the privilege of being present. That the gifted lady herself appreciated her reception is confirmed by the following brief extract from a letter addressed to the President the next day:—" I felt rather overwhelmed last night, and am beginning to consider myself a sort of Solar Myth ; but I did feel everyone's kindness very much. I am afraid I shall not be fit for the Saturday Excursion, but I suppose I need not decide till to-morrow. How many do you think were present last night ? It was a much better audience than I expected." Happily for once, as we now see it—for it might have hastened her end—the indifferent weather prevailing at this time proved a blessing, for we abandoned our intended excursion to Sutton Coldfield, to the disappointment of many, as her friend, Dr. Showell Rogers, had promised to read an interesting paper which, however, he afterwards gave at the Mason College. Miss Naden called on the writer of these lines for the last time, for a few minutes, on Friday, the 25th October, and, although she did not utter a word of complaint, her intelligent face looked anæmic, anxious, and careworn, so very different from its radiant appearance only three nights before. Her energy, however, seemed unabated, and even at this time, with but little persuasion—which, however, was not attempted—she would have joined the excursion. Reference was made to the address, which was shortly to appear in the " Midland Naturalist," and she expressed herself pleased at the notice of it in the day's *Daily Post.* Little thinking that we should never meet again, the writer bade a cordial good-bye to the cherished friend whom he saw no more.

As read by the light of subsequent events, how inexpressibly sad seems a passage in this address alluding to the incomplete knowledge of our own times :—" What are we

ourselves viewed as social units? Whither are we moving, and what is the curve of our line of progress? What is the goal towards which we are really working?—for it may be, and probably is, far other than that which we set before our imagination. Not possessing the solution of these enigmas, we cannot know the full sociological significance of our own day or of any previous day, since part of that significance lies in the unseen future. The future is, without doubt, as rigorously predetermined by past and present as the nature of the harvest is predetermined by the nature of the seed that is sown. If we really knew the crop, we could both predict the harvest and could trace its past history from the formation of the ovule to the liberation of the seed when mature. No child of the century can truly understand himself or his age, or can solve the problems in which he himself is a factor. If he could, he would be a child not of this century, but of all centuries. As our knowledge advances, and as our apprehension of principles becomes more definite and coherent, we may learn to distinguish many of the streams of tendency which flow around us or bear us onward; but the inter-actions even of those which are seen are far too complex to be worked out by the clearest intellect. And we can never be certain that the most important currents have not remained unobserved just because we are moving with their motion."

What happened after the Birmingham visit may be briefly told. Symptoms of severe internal illness were discovered, and, as the result of several medical consultations, presided over by Sir Spencer Wells, an operation was decided upon, and performed by Dr. Lawson Tait, at her residence, 114, Park Street, Grosvenor Square, on Thursday, the 5th December. The public were then informed of the critical state of the patient. For some little time it was hoped that she would have sufficient vitality to recover, and only a few days before the fatal termination of the illness Mrs. Daniell wrote:—"I am very happy to tell you that our dear friend is now getting on very well. She is very weak, but I trust that will soon be overcome by the kind care of Dr. Grigg and nurses, and she is able to take a fair amount of nourishment. We hope to-morrow to remove her to another bed." Sorrowful to say, the improvement was not maintained, and, after a fainting fit, which occurred about 11 o'clock in the forenoon of Sunday, December 22nd, she became extremely weak, and on the following day, December 23rd—ere she had fully completed her thirty-second year, and retaining perfect consciousness—she gradually sank, and at 1-45 p.m. quietly "passed to where

beyond these voices there is peace." Necessarily, her medical attendants are extremely reticent as to the details of her illness, but such as could be given strongly impress one with the extraordinary courage and powers of endurance she must have had. Practically, her illness had taken a fatal form as early as June or July last, from which only an operation of the most desperate character afforded the slightest chance of relief. Circumstances unfortunately delayed this until the time above stated, when all reasonable chances of recovery had gone. Yet, in spite of this, her marvellously placid temperament enabled her to pull through so as almost to make a recovery. So far indeed was this recovery effected that she was almost able to leave her sick-bed, and her sudden death could be entirely attributed to conditions which had arisen long antecedent to the operation.

Only so recently as the last meeting of the Sociological Section, held in the month of December, a resolution was passed congratulating Miss Naden on her progress towards convalescence, and on the first meeting in January, when her death was announced, the Section recorded "the deep sense of regret at the irreparable loss which the cause of Evolution had sustained by the early death of their gifted friend and colleague, who for many years had advocated the doctrine of the Synthetic Philosophy with a genius, ability, and enthusiasm rarely equalled." At a meeting of the committee of the Central National Society for Women's Suffrage, held in London in January last, presided over by Lady Sandhurst, the following resolution, upon the motion of Mrs. Ashton Dilke, seconded by Miss F. Pennington, was unanimously passed:—"That the committee have heard with profound regret of the death of Miss Constance Naden, who had evinced her warm interest in women's suffrage by entering the ranks of those who publicly advocate the question. They deplore the loss of one who, by her ability and zeal, would have done so much to advance the cause of women, and they would respectfully tender to the members of her family their most sincere sympathy."

A few words may be devoted to personal characteristics, which are pleasant to dwell upon. It was impossible to be in Miss Naden's company without the unmistakable feeling that one was in the presence of a superior intelligence. To a stranger there appeared at first a kind of deep seriousness or natural shyness in the slim and fair unaffected girl, who from her youth and freshness seemed so little qualified to enter into recondite subjects, but this feeling immediately passed away when her bright smile showed sympathy with any

subject of interest. And when her conversation warmed with enthusiasm, as it often did in discussions on the subject of evolution, one always felt that it was better to listen than to talk. In speaking, her voice, which was usually of high pitch—and had a slight natural peculiarity in the pronunciation of the letter "r," rather pleasing than otherwise—was remarkably clear, impressive, and penetrating, and she was equally confident either before a small or a large audience. Music had little attraction for her, but her poems exhibit a skilled knowledge of the laws of rhythm. For gardening she had no taste, though so fond of flowers and botanic studies. Her sense of humour was decidedly keen. This came out sometimes in conversation, and is conspicuous in several of her poems, and occasionally appears in her prose writings. To her friends her manner was undeviatingly kind, cordial, and affectionate. Her letters, in very dainty hand-writing, of which a few brief extracts have been given, were singularly frank and genial. Her fine and sweet temper was especially remarkable.

The life-long friend previously alluded to, thus writes to me her impressions :—"No one had a keener appreciation of fun, or entered more readily into a frolic than Miss Naden in her college days. She shared in all the frivolities of the ladies' room—the afternoon teas, at which

> The cups were every shape and size
> That chance or purpose could devise ;
> But one and all the self-same hue,
> And that was like the maidens—*blue*,

and the *very* occasional gossip. In conversation *a deux* Miss Naden had a special charm. She not only gave of her best, but extracted the best that was in one. To talk to her was, indeed, to drink in inspiration ; to receive a letter from her brilliant, facile pen was to know a joy which falls to the lot of few. It is difficult for one who has grown up with Miss Naden from childhood, and known her primarily as a tenderly affectionate and deeply sympathetic friend, to at all realise the impression of hardness and reserve which she is said to have produced upon strangers. Like George Eliot, she had the intellect of a man, but the heart of the most womanly of women, and though science and literature were much to her, love and friendship were infinitely more. What we have lost, whom she loved and who loved her, no words can say ; the grief is still so recent that as yet we scarcely dare to gauge it."

And now there remains but the final scene to record. On Saturday, 28th December, 1889, under leaden-coloured skies, in a bitter north-east wind, and with "rime in the air, sucking

the vital warmth out of every living thing," all that was mortal of the gifted poetess and philosopher was consigned to its resting place at the Old Cemetery, in the grave where repose the mother whom she never knew, and those "guardians true" who had watched her from her infant days

"With tenderest love and care."

The ceremony was singularly quiet and unostentatious, "bestowing peace for grief," the mourners being the father and other sorrowing relatives, together with her fellow-traveller and companion, Mrs. Daniell. A few friends beyond this sacred circle reverentially attended to pay a last tribute of respect to the beloved one for whose sterling work in the past they had such profound admiration, and of whose potentiality in the future they had formed a still higher estimate. They included Miss Charles, B.Sc., and Miss Edwards, B.A., on behalf of the lady students of the Mason College; and the following as principally representing the Sociological Section, namely:—Alfred Browett, W. B. Grove, M.A., Alfred Hayes, M.A., W. R. Hughes, F.L.S., W. Showell Rogers, LL.D., and Ernest C. Rogers, LL.D.

The solemn ritual of the Church of England was performed by the Rev. W. E. Ivens, M.A., Vicar of St. James's, and as we mournfully left the deep open grave in the soft red sandstone, wherein were placed by loving hands wreaths of fresh green maiden-hair fern, intermingled with camellias and other white flowers, our thoughts turned to the bright spirit whose course had been so brief here, but who had nevertheless left her impress, as unconsciously foreshadowed in her ever-memorable lines in "The Pantheist's Song of Immortality"—

"Thou yet shalt leave thine own enduring token,
For earth is not as though thou ne'er had'st been."

And so, in the closing words of that other lofty poem, the merits of which she was among the first to recognise,

"THE DEWDROP SLIPS INTO THE SHINING SEA."

W. R. HUGHES.

(To be continued.)

THE ORIGIN OF DECORATIVE ART AS ILLUSTRATED BY THE ART OF MODERN SAVAGES.*

BY HENRY BALFOUR, M.A., F.Z.S.

The Fine arts have for so vast a period proved so essential to us, that it is difficult to picture to ourselves the time when they did not exist at all, and when the æsthetic feelings of

*Paper read before the Oxford Natural History Society, 28th January, 1890.

the human race were yet so little developed that no attempts were made to create anything whose function was to be beautiful, and to excite the emotions, whether by appealing to the ear in the form of music, or to the eye by virtue of elegance of form or colour. Still as we know that Man himself gradually emerged from a lowly state, and that every branch of culture, however elaborate it may be now, arose from the simplest beginnings, so, in considering the growth of the Fine arts, we must refer them back to the simplest origin, and speculation upon their origin presupposes the time when they did not exist.

I do not propose to deal with the fine arts generally, but shall restrict myself to the consideration of one branch, that of Decorative art, and examine such evidence as we have of its gradual growth, and its advance from the simple to the complex.

It is impossible to give any date to the origin of decorative art. The appreciation of the effects of artificial decoration does, in fact, appear to extend beyond the limits of the human race ; instance the various birds (bower birds, magpies, etc.) which ornament their nests and other structures with bright objects, such as shells and other articles foreign to the elements required for mere construction. With them, however, this seems to be the result of attraction to bright and glistening objects generally, and there is no true creative operation of the intellect which characterizes the use of decoration as a fine art. In the same way, no doubt, Man in his earliest and most uncultured state appreciated to some extent beauty as occurring in Nature, and was attracted by any uncommon peculiarities in familiar objects which presented themselves to his notice long before he conceived the idea of imitating them.

The earliest attempts of Primæval Man in the fine arts are completely involved in obscurity, and the true history of their gradual development can only be speculated upon. Among the oldest known products of man's handiwork we find no traces of ornamental art. The rude implements roughly made from lumps or flakes of flint, which are found in the gravels of the "river drift," and which are the earliest evidence we have of man's attempts at manufacture, are never embellished with decoration of any kind. Indeed, the material, hard and difficult to work into shape, is unsuited to decoration, except in the most expert hands.

It by no means follows that man in the so-called "Drift Period" was unacquainted with artificial ornamentation. He very possibly frequently carved rough and simple decora-

tion upon his implements of wood and horn, or other soft materials, but these unfortunately have not been handed down to us, having been unable to withstand the destroying action of time, leaving only the hard and practically imperishable implements of flint to indicate to us the state of culture in those extremely remote ages.

In later, though still very remote times—in the "Cave Period" so called—evidence of considerable artistic skill has been handed down to us. At this period man, in the South of France and other regions of Western Europe, was living under very different and far less genial conditions than now exist in these regions. There is much evidence to show that the climate, even far south, was then a very cold one; and man was contemporaneous with such animals as the mammoth, cave bear, and others long since extinct; while the reindeer, now only to be found in the extreme north in Europe, was perhaps the principal feature in his surroundings. Under these circumstances we should expect to find a race of men fitted for a more or less Arctic existence; a race of hunters and fishers, dependent principally upon flesh and fish for their food. This is precisely what we do find. The "cave dwellers" have been aptly likened to the Esquimaux of modern times, and one of the most striking resemblances is found in the condition of their artistic attainments. Very many of the numerous implements made of reindeer horn, which have been found in the French and Swiss caves of this period, are decorated with representations of animals, many of which are very life-like and well executed, showing a state of artistic culture which appears disproportionate to the primitive surroundings. Some of the sketches are poor and indistinct, it is true, but others are spirited and clever life studies of various animals, such as horses, reindeer, fish, etc. The figure of a mammoth, scratched upon the surface of a piece of the ivory tusk of this animal, has been often quoted and figured, and is an excellent example of the earliest known attempts at realistic representation. We find, moreover, sketches of man himself among these carvings. Examples are given in Lubbock's "Prehistoric Times," and many other works.

This was pre-eminently an age of *realistic* representation; the sketches, which are for the most part scratched upon the surface of reindeer horns, being evidently intended to be faithful representations of the animals, and little more so far as decorative art was concerned, though it is probable that they were frequently intended to record events,—the most simple form of "picture writing," in fact.

Occasionally, however, a departure from realism, or "portraiture," is seen, as when, for example, the handle of a dagger made of reindeer horn has been carved into a representation of some animal. In this case it was often necessary to distort the animal's attitude in order to adapt its form to that of the handle; and this form of representation, though fairly accurate so far as is compatible with the strained attitude, must be classed as conventionalized for purposes of ornament, thus differing from the incised sketches which must for the most part be placed in the category of portraits, or purely realistic art. Many of the implements exhibit decoration of a purely conventional character of a very simple nature, such as chevrons, plain lines, and notches; but, nevertheless, we must regard the characteristic art of the "Cave Period" as "realistic." Realistic art is characteristic of nearly all those savage peoples which lead the nomad life, and depend chiefly upon the products of the chase for their food supply.

At a later period, during the age known as the "Neolithic," or "New Stone Age," we lose sight of the bold realistic representation so characteristic of the "Cave Period." Such carvings as may be classed as realistic are for the most part both rudely executed and poor in design, and moreover rarely found at all. The greater part of the artistic skill of this period seems to have been lavished upon the shape and finish of the implements of stone, which are often of very beautiful form and frequently highly polished all over.

Although the art of design of the Neolithic period was inferior to that of the cave period as regards the realistic style, or life studies, still, in conventional or fanciful decoration, a great advance is observed. The art of this age was lavished rather in embellishing and beautifying useful objects than in, so to speak, sketching from nature. Its "school" was a very different, but by no means an inferior one.

Even the implements of flint, such as daggers, works of art in themselves, were sometimes ornamented with zig-zag lines laboriously chipped upon their surfaces, showing how complete was the mastery over this hard and difficult material.

We are still very much in the dark as to the implements of softer nature of this period (those of wood and horn), these having perished almost entirely, and we can only suppose that these were frequently embellished with carving more elaborate, no doubt, than that bestowed upon the harder materials.

I need not pursue any further the subject of our knowledge, or, perhaps, rather our ignorance, of the art of the

remote ages. I have made these few remarks upon the art of the important periods, the "Drift," "Cave," and "Neolithic" periods, in order to show how incomplete is the record. It is clear that the relics of prehistoric times give evidence of marked phases or epochs in the history of art; but, even when treated in detail, the succession of ideas required to form a complete history is by no means clear. We have only isolated links without the means of connecting them into a continuous chain.

With the lack, therefore, of direct historical record, we must look elsewhere for evidence of the origin and progress of decorative art; and, by examining the conditions to be found in those living races of mankind, which are most nearly allied to primæval man, form from these our conclusions as to the actual history of art in the human race as a whole. We, therefore, turn to those races of modern *savages* which we believe to be the lowest in the scale of civilisation, whose condition of culture is in the most primitive of existing states. These should certainly, in some sort, supply our want, as we have every reason to believe that these types of mankind really represent, to a very great degree, the condition of Man in the remoter ages, when he was largely dependent upon natural objects, or the forms of nature but slightly modified, for his implements, and when the art of manufacture was still in its infancy.

As in the useful arts, so also in the fine arts, we find the lowest savages deriving their early ideas from nature. We find very much that, in the matter of æsthetic achievements, the condition corresponds with their primitive state of culture. The ornamentation of their weapons, for example, is for the most part extremely simple (I am referring to the lowest savage peoples, such as the Australians, the Bosjesmans, Andamanese, etc.), frequently, in fact, consisting of nothing more than natural peculiarities in the material,—it may be knots in the wood or nodes on a reed stalk, which are slightly emphasized with colour or other means in order to produce a greater decorative effect. In the Pitt-Rivers collection, at Oxford, is an Australian "boomerang" of light-coloured wood, in the grain of which are a number of knots, at about equal distances from one another, along its length. The savage owner was evidently struck by the uncommon effect of this arrangement of the knots, and in order to increase this effect, he stained each knot a dark colour, thus throwing them into greater prominence on the light ground colour. Here we have an extremely simple and primitive form of ornamentation, suggested by a natural peculiarity in the

wood of which the weapon is made ; the appreciation of which, suggesting that the effect might be intensified, requires but a very slight intellectual effort.

Any natural peculiarity in the material used in the manufacture of objects of every-day use would be sure to attract notice ; and possibly, in the first instance, would suggest itself as a convenient mark of ownership. That is, as a sign whereby to distinguish a particular object from other similar ones belonging to other people.

From the mere appreciation of the uncommon to the artificial increasing of the effect, the step is, as I have said, but a slight one ; but we must always bear in mind that in a low state of culture, such as that of the lower savages, progress advances by extremely slow stages and not by sudden strides. We have, nevertheless, in the instance I have given, an example of the first stage in the development of decorative art, which may well be taken as an illustration of the "Dawn of Art" in the remotest ages.

(To be continued.)

NOTES ON THE QUATERNARY DEPOSITS OF SHROPSHIRE.*

BY CH. CALLAWAY, D.SC., M.A.

It is usual in annual addresses to refer to the work of the preceding year. In the present case, such reference is hardly necessary, as the Annual Report for 1889, issued to members late last year, describes the work of the Club with tolerable fulness. Without further preliminary, I will, therefore, direct your attention to what we may do in the future.

In my last address, I indicated in a general way some of the advantages of a study of nature, and I pointed out the unrivalled opportunities for investigation supplied by this county. I now propose to confine myself to one particular line of enquiry, which I have selected for three reasons. It may be pursued in the absence of technical scientific knowledge, it is a path which has hitherto been but slightly trodden, and it joins on to the more beaten tracks of archæology, anthropology, and history. I refer to the study of the superficial deposits, the gravels and boulder-clays, which form an irregular sheet, covering our central plain, running into our valleys, and creeping up the slopes of our hills and

* Annual Address as President of the Severn Valley Field Club, delivered at Ironbridge, March 4th, 1890.

mountains. I have been blamed for deluging our members with too much geology. Naturally, I speak more freely on what I know most about ; but I now invite you to join me in an investigation which may throw light upon a period which comes within the scope of the archæologist. In a mole-like manner, I have been accustomed to burrow deep into the foundations of the earth's crust. But I do not now ask you to follow me down to the realm of "chaos and ancient night." I desire to introduce you to one of the most recent of the geological epochs, to the period when the British Islands were preparing for their final emergence from the waves, and man had already appeared upon the earth.

The superficial deposits of Shropshire have received some notice from Mr. G. Maw, in "The Quarterly Journal of the Geological Society" for 1864, and from Mr. C. J. Woodward, in a paper read before the British Association, in 1865. More recently (in 1869), Miss C. Eyton, in her "Notes on the Geology of North Shropshire," has given an excellent description of many of the sections. Our knowledge, however, of the glacial epoch, to which these deposits belong, has greatly increased during the last twenty years, and in the light of the new theories we may hope to advance upon the conclusions of our predecessors. I should add that a committee of the British Association has been for many years investigating the glacial phenomena of Britain. Their work will not interfere with ours, and Dr. Crosskey, of Birmingham, the secretary of the committee, will only be too glad to know of any success we may win.

Before I indicate the most fruitful fields of enquiry, I must sketch the state of our present knowledge.

The glacial formations of Shropshire consist chiefly of sand and gravel. Associated with these are patches of clay containing fragments of rock. Similar blocks, but often of great size, are scattered in large numbers over the surface of the country without any visible relation with the other deposits.

The sands and gravels have been noticed in the valley of the Severn, near Ironbridge, at many points near Wellington, and at numerous localities in the northern plain of the county. I have recently seen them on Grinshill Hill, just below the summit, and Mr. E. S. Cobbold, F.G.S., a member of the Caradoc Club, informs me that he has found drift gravels and boulders on the Longmynd up to 1,000 feet. At Ketley, the sands are beautifully rippled, as by the action of the waves. Marine shells, including the common cockle, are found here and at many other localities. Besides the fossil remains of

animals that lived in the glacial sea, the sands contain rolled specimens of fossils derived from much more ancient formations. The pebbles of the gravels consist of a considerable variety of material. Igneous rocks, as granite, felsite, porphyries, and greenstones are the most abundant. Quartz is also very common. In smaller proportion are grit, limestone, and slaty rocks. On the eastern side of the county, rolled flints are very numerous.

The boulder-clay occurs much less abundantly than the gravels. At Ketley, it forms a bed, about eight feet thick, on the top of the sands. Patches of the clay are found elsewhere; but whether the position of the clay, as a whole, is above the sands and gravels has not been determined.

The large boulders usually consist of granite or some other igneous rock. They are very numerous in some places. At Wellington, for example, they are often used for mounting-blocks.

The rolled fragments and the *remanié* fossils in the glacial deposits of Shropshire afford valuable information. The granite has come from Scotland or the Lake District; some of the igneous rocks from North Wales, others from the Wrekin; rolled flints, probably from Eastern England; grits and limestone from the Welsh border; sandstone and quartz from the Triassic hills of North Shropshire. Recently a workman found in a sand-pit near my house a good specimen of a fossil shell, *Waldheimia obovata*, derived from the Cornbrash, a division of the Lower Oolite. It appears probable that this specimen has come from the South or East of England.

How have these travelled stones and fossils been conveyed to our district? We can conceive of no probable agency except ice. Did this ice move on the land, as a glacier; or in the sea, as icebergs or ice-floes? The late Professor Carvill Lewis, of Philadelphia, who had done admirable glacial work in his own country, visited Europe in 1886 and 1887, and, in the course of his investigations, studied our Salopian deposits. The general view which he was disposed to hold was that, in the glacial epoch, a great ice-sheet spread over Northern Europe, not only covering the land but filling up the shallow seas. This huge glacier moved southwards over the British area as far as Northern Shropshire, where it formed a terminal moraine. Glacier rivers issued from under the ice, and glacier lakes were formed amidst the moraine-accumulations. According to this view, our boulders were mostly conveyed to the area by the glacier, and our sands and gravels were deposited in the glacier-lakes. I have been unable to accept this view, so far as this district is concerned,

for many reasons. It may suffice here to state that the travelled stones have been conveyed, in some cases, from south to north, that the shells in the sands and gravels are marine shells, and that during the formation of these deposits there was a submergence of the land of at least one thousand feet. I think the condition will be better explained by the following theory. Central England was covered by a sea that at one time rose nearly to, or perhaps above, the highest hills. This submergence and the subsequent emergence were very gradual, so that the plains of Shropshire lay for ages beneath the waves. Ice-floes and, perhaps, icebergs, conveyed by currents from different points of the compass, drifted to and fro, and, when they melted or capsized, deposited their stony burdens over the sea-floor. There were, probably, small local glaciers formed on the flanks of some of our hills when the land stood rather high; but of the occurrence of an ice-sheet in Shropshire I have at present found no satisfactory proof.

I have been too busy with the older rocks of Britain to give much time to the drifts of Salop, but I should be pleased to aid any who will take up this interesting study. We want a careful mapping of the whole area. The nature of the deposits and the probable origin of the travelled fragments should be indicated. The exact relations between the boulder clays and the gravels must be ascertained. Above all, it is of the first importance to find out if there are any indications of the occupation of the region by man previous to or during the glacial epoch. At a former meeting of the club, one of our members, Mr. W. K. Wyley, of Shrewsbury, exhibited a flint implement which he had found on Grinshill Hill, a little below the summit. This flint has apparently been shaped by human hands; but as it occurred at the surface of the ground, and not in the sands and gravels which appear somewhat lower down the slope of the hill, we are left without indication of its age. These flint tools and weapons should be looked for in the sands and gravels.

Miss Eyton (*supra*, p. 77) gives an interesting description of the deposits which succeed the glacial sands and clays, though probably by a considerable interval. These newer formations she assigns to two ages—the Lake Period and the Forest Period. To one of these epochs may probably be assigned some deposits which I have recently examined in Wellington. They occupy a hollow lying in front of the church of one of our vice-presidents, the Rev. Thos. Owen. At the base are the marine gravels, with grooved and striated stones. Then comes a thin layer of blue clay, overlain by

shel marl, and a bed of peat caps the whole. Subsequent to the emergence of the land, a small lake lay in this hollow. Fresh-water molluscs flourished in its waters, and their comminuted shells accumulated to form the marls. Then the pool was choked up with vegetation, and became a bog. The lake deposits of Shropshire have yielded human implements, and belong to a comparatively modern prehistoric epoch. They should be looked for throughout the county, and should be searched for the remains of man and his handiwork.

While these more recent formations are of much interest, I have laid greater stress upon the glacial deposits. It is in these that the evidence of man's existence becomes of peculiar value. No one questions the fact that men lived in the Lake Period, but how far their history can be traced back into the dimmer ages is still an unsettled question. A careful study of the superficial drifts of this county may help us to approach a solution. If we share the sentiment of Terence—

"Nil humani alienum a me"—

we shall find the search for flint implements one of the most fascinating that can engage our attention, and shall discover new confirmations of the belief that "thro' the ages one increasing purpose runs."

ON THE MOTION OF THE CILIA OF ANIMALCULA AS SEEN BY FLASHING LIGHT.*

BY GEORGE J. BURCH, B.A., OXON.

The subject matter of my lecture to-night falls naturally into three sections—the Problem, the Apparatus, and the Results.

The problem is this:—There are a certain number of animalcules which appear when in the act of seeking their food as if their heads were surrounded by spokes, as of a wheel without a tire in rapid rotation. So remarkable is this appearance that it suggested at once to their discoverer the name of Rotifer, or wheel animalcule, by which they are universally known. But among the innumerable varieties of appendages and limbs, and the countless forms of joints and articulations and adaptations of various organs to the needs of their owners, we have no instance of the wheel and axle. Evolution draws the line at that "simple machine."

Plainly, then, this appearance of a wheel revolving must be an optical illusion. This fact, indeed, was recognised by

*A paper read before the Oxfordshire Natural History Society February 11th, 1889.

the earliest observers, and, as they pointed out, what we see is not the cilia themselves, but a sort of shadow or spectre caused by their passing in front of each other in succession. A similar phenomenon is frequently seen in railway travelling when passing by a double row of iron railings. The pales in the further row, being at a greater distance, do not appear to coincide with those in the front row, except at intervals, and the result is that as the observer is carried rapidly past them he sees, as it were, the ghost of a set of railings much broader and farther apart than the real ones.

So it is with the animalcules; probably a good many people here have never seen the real cilia, and have no idea how close they are together.

The problem, then, is: How can we study this movement so as to see the action of the cilia themselves?

We may do it by leaving the creatures for a long time upon the slide without renewing the water. In plain English, by partly suffocating them. Or we may administer a homœopathic dose of alcohol or chloroform, which will in many cases so reduce the rate of movement that it can be followed with the eye. But, in so doing, we have not completely solved the problem, for we are not sure that their behaviour, like that of more highly organised beings, may not be somewhat different when in liquor, and we have left unanswered the interesting question as to how fast they are in the habit of moving when sober.

I come now to the apparatus. Most people are familiar with the zoetrope. It is a toy in which a number of pictures (as, for instance, of a tumbler in the successive positions he assumes in the act of turning a somersault) are presented one after another to the eye. The pictures are placed inside a revolving drum, pierced with slits, through which the spectators see them in succession. Now, it is well known that the human eye retains for a short time the impression of any image formed upon the retina, so that if these images follow one another, as in the zoetrope, in sufficiently rapid succession, they are combined in our perception of them into one image, which, in this case, appears to move. What we require now, is to solve the converse problem and to obtain successive glimpses of a moving body, so that it may seem to stand still or nearly so. Let us suppose we have a clock with only a minute hand, and that once every hour we glance at it; the hand will be always in the same place and will appear to have stood still. But suppose that the clock, instead of keeping time, gains five minutes in the hour. After one hour, it will seem to have moved five minutes; and in two hours, ten; and

so on, until in twelve hours it will appear to have made one complete revolution, though in reality it has made thirteen. Now, imagine that our minute hand revolves at a speed of twelve times in a single second, and that instead of simply glancing at it at the right moment, which we can no longer do, we illuminate it with a sudden flash, leaving it in darkness the rest of the time, then, if we make twelve flashes a second, the clock-hand will appear always in the same position, whatever that may happen to be; only, the flashes being so rapid, the eye will receive a continuous impression, and we shall think we see it standing still. And so, also, if while we give twelve flashes a second the hand revolves thirteen times, it will appear to us to be revolving steadily once round every second.

An apparatus for producing flashes of light for this purpose is called a stroboscope, and was used originally for observing the vibrations of a stretched string. I will now exhibit the particular form of stroboscope which I have employed for studying the motion of the cilia of the animalcula. I make no apology for the roughness of the instrument; it is just as I made it in 1873. It consists of a board in which is a stout piece of wire bent over at right angles, at a height of about twelve inches, and pierced with a hole, through which this upright steel spindle may work. This spindle, if I must confess the truth, is half of an umbrella spoke, and let me tell you that you can get no better steel for such purposes than the spoke of a good, old-fashioned umbrella. The lower end is filed to a point, and works in a dent punched in a small piece of tin-plate. About one and a half inches from the bottom is a small wooden disc, which supports a circular card some seven inches in diameter, with ten narrow slits, each two degrees wide. Two leaden balls hang from a point just underneath the upper bearing of the spindle by strings of exactly equal length. Just above the weights there is a guide, formed of two light curved wires, between which the strings move freely: the whole arrangement being very much like the governor of a steam engine, with this difference, that the weights being supported by strings, the length of the strings, and, consequently, the rate of the governor can be altered by sliding up or down a little ring of wire, which embraces the spindle, and through which the cords pass.

If I now, by taking hold of the top of the spindle, cause it to revolve, the balls fly out at an angle and continue to revolve, carrying the disc with them, until they gradually hang vertically once more, when the thing stops quite suddenly.

What I wish to point out is, that the rate of revolution is practically constant so long as the balls are swinging freely. If I pinch the spindle so as to check it, the balls come nearer together, but the disc, in spite of the friction, goes no slower. Or, if my experiment is not finished and I perceive that the balls are approaching the vertical, I need only give it an extra spin, and the balls fly out again, *but it goes no faster even while my hand is on it*, unless I continue spinning it until the cords press against the ends of the wire guides. The only way of altering the rate is by shortening the strings in the way I have mentioned with the slider.

A little consideration will show the reason of this. A weight hanging on a string forms a simple pendulum, in which the time of vibration is independent of the amplitude of the swing, and depends only on the length of the string. Now a weight hanging on a string may not always swing to and fro in a straight line, but may describe an ellipse, which will, however, make no difference in the time it takes to come round again to the same place. Imagine, then, such a weight swinging not merely in an ellipse but round and round in a circle, and you have the principle upon which this apparatus is constructed. If these cords were 39 inches and a fraction long they would swing, as a pendulum, to and fro in exactly two seconds; or revolving, they would turn the disc once round in two seconds. Being, as they are, one quarter of that length, they cause it to revolve once every second, and as I can by the slider reduce them to one-quarter of their present length they will then maintain a practically constant rate of two revolutions per second for nearly three minutes without a fresh impulse.

My disc has ten slits in its circumference. I am therefore able to get from ten to twenty flashes of light every second.

I have described this instrument minutely because it costs practically nothing, and is sufficiently accurate to take the place of a very expensive piece of apparatus.

It should be made as light as possible, so as to concentrate all the weight in the leaden balls. The light is thrown by a bull's eye condenser upon a small mirror placed above the disc, and is reflected downwards through one of the slits upon another similar mirror underneath it, whence it proceeds to the microscope, which must be furnished with a good Abbé condenser, so as to obtain a maximum intensity of illumination. When this has been satisfactorily adjusted the machine is set spinning, and the rate altered by the slider—without stopping it—until the cilia of the creature under observation appear to stand still. The number of flashes per second

which produces this effect may either be calculated from the length of the strings below the slider, or more simply by counting the revolutions during 100 seconds, multiplying by the number of slits in the disc, and then omitting the last two figures.

Now, as I want to make this paper as much a study of apparatus as of cilia, I will proceed to discuss the question which ought always to be asked with regard to any invention, namely : What are the conditions of accuracy, and how large are the errors of this method ? The cilia are in many cases fine, like bristles—shall we see them as bristles ?

Let us return to the illustration of the clock hand. Between one flash and the next the hand moves once round the dial, but during the flash it also moves. Now my ten slits upon this disc are 36 degrees apart, and each one occupies 2 degrees, so that the proportion of light to darkness is such that during the flash the clock hand would have turned through an angle equal to 3 minutes and 20 seconds clock measure. It would appear then not as a sharp line, but blurred into a fan shape. It will at once occur to you that to get good definition we must have short flashes, and therefore narrow slits; but then another difficulty comes in, namely, that in reducing the duration of the flash we reduce the quantity of light that reaches the eye, and this is very nearly the same as reducing its brilliancy, so that a limit is soon reached beyond which there is not light enough to see by. Evidently the remedy for this is to have a brighter light, and, in fact, we want the brightest possible light for the shortest possible time. What that light is, the familiar metaphor both for brevity and brilliancy will at once suggest —a flash of lightning. Thanks to the inventions of our century, it is possible for us to secure a succession of such flashes. We need only use a metal disc with slits, and connect one pole of our battery with it while the other is connected with a wire rubbing against the disc. Then, as each slit passes, we shall get what is known as the break spark, which will be more intense if a large coil of wire is included in the circuit. Unfortunately I am not able to show you this to-night, as I cannot procure in this part of the Museum a current strong enough. I may, however, say that the definition obtainable in this way is perfect, and the effect extremely beautiful.

I now pass to the third division of my subject, namely, the observations made with this apparatus. I must premise that what I have to say does not refer to the small cilia upon the bodies of some animalcula, but rather to the larger and

stronger ones about the head or mouth, the main function of which is to procure food or propel the creatures from place to place.

Of these there are two kinds, namely, those that stand singly or in pairs, and those disposed in rows. The first kind are called flagella, and they occur mainly among the very small creatures, and are in consequence difficult to study with this apparatus. I have, however, ascertained that they move in a way quite unlike the others. Using a dark ground illumination, with direct sunlight, I was able to see that the flagella of Codosiga vibrate circularly, in such a way that a point a short distance from the free end remains still, while the end itself describes a small circle. The movement is difficult to describe, but can easily be imitated with a long and flexible switch.

In the second kind of cilia, namely, those disposed in rows, such a motion is impossible, and accordingly we find them moving with a to-and-fro action. But a very little experience will show that it is impossible to generalise with regard to them.

Some vibrate at a steady speed for hours—others give periodic whirls lasting half a second or more, with a pause of greater or less duration between each, this being especially the habit of the free-swimming kinds. But those in which the cilia are set in a circle, especially the stalked species, are far more regular in their habits. The *Epistylis flavicans* which I am showing to-night, and for which I am indebted to the kindness and good fortune of our Secretary, Mr. Underhill, began this evening at about ten vibrations a second, and is now going steadily at thirteen.

But last night the only creature I could find in my own bottles was a tiny Vorticella, which was whirling away at a rate utterly beyond the powers of my little machine. I succeeded once, by fixing the lead weights, in twirling the disc fast enough to make the cilia seem to stand still, and I estimate the speed at forty or 50 to the second.

When we consider the small size of the creature, and the density of the medium with which it is surrounded, such a speed is truly astonishing, and must indicate an expenditure of force that is relatively very considerable.

It is interesting to note the unfolding of the cilia, and the manner in which the action is commenced. In the Stentor they are raised up from the disc one after another in regular order, and when the last is straightened out there is a slight pause before the whole set start off at full speed. You will notice slight variations of the rate, indicated at

irregular intervals by a wave appearing to pass along the otherwise apparently still row of cilia. You will also notice occasionally a curious curling in of the tips of one or more cilia. This action is not an optical illusion—I have seen it with continuous light when the cilia have been moving slowly, and can testify that single cilia are capable of being stimulated and made to contract either at the root or at the tip, so as to bend over or curl round an object near them. The two actions are quite distinct, and indicate to my thinking a greater complexity of structure and function than is commonly ascribed to these organs.

Many of the Vorticellæ have also a single cilium or flagellum in the mouth, serving as a tongue, to secure or reject the particles brought within reach by the other cilia. This cilium usually vibrates at a different rate, and is not so regular in its movements.

In conclusion, I would say that there is evidently a wide field for research in this direction, and one which promises to extend our views in regard to the minute anatomy of the simpler forms of life. Since I first attempted it, seventeen years ago, there has only been, so far as I know, one paper written on the subject, the reference to which, however, I have lost. The apparatus necessary is, as I have shown, both simple and easy to make, and I hope it may be employed with good results by members of this society who may have more leisure than myself.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION.—Meeting, April 1st. Mr. J. Levick in the chair. Mr. W. H. Wilkinson exhibited a rare lichen, *Platysma juniperinum*, having a bright yellow thallus, brown fruit, and black spermogones; it was gathered 4,000ft. above sea level, on Galdhöpiggen, Norway. Mr. J. Edmonds gave an instructive and interesting paper on "Optics of the Microscope," illustrated by drawings and lantern photographs. He traced the history and construction of the microscope from the "pin-hole in cardboard" and simple lens, through its different stages of development up to its present perfection, with its fine achromatic lenses and numerous addenda for adjustment and illumination. He then gave a series of micro-photographs which he had taken direct from the objects themselves, illustrating the advantages of the various combinations of lenses; and Mr. C. Pumphrey gave the lime-light illustrations. A hearty vote of thanks was passed to both gentlemen for their valuable services.—GEOLOGICAL SECTION. April 15th. Mr. Waller, B.A., B.Sc., in the chair. Mr. Horace Pearce, of Stourbridge, read a paper on "Personal Observations of Glacial Action among British Mountains." The paper was illustrated by hand specimens of rocks from various glaciated districts. A cordial vote of thanks was given to Mr. Pearce.

CONSTANCE C. W. NADEN: A MEMOIR.

(Continued from page 105.)

Part III.

Der Kühne Dichtertraum ist nicht verloren,
  Er war zu eng, zu bleich:
Nur in des Menschen Seele wird geboren
  Das Erd—und Himmelreich.

Das Ideal.

Constance Naden came to us in 1881. The story of her life at College would be short enough if a successful student-life could be summed up in a simple record of marks, classes, or degrees. For the official testimony of the College Calendar shows that a very few class places and prizes taken, without obvious effort, in the course of some five years given to lecture room and laboratory, represent all there is to show to the outside world of the career of the most brilliant student the doors of Mason's College have yet admitted.

The proof that this estimate of her powers was shared by all her teachers is to be found in the roll of "Associates" of the College, where it may be seen that there is but one name to which is joined neither official title, nor University distinction, nor College diploma, in explanation or justification of its place in the list. Professors, and students perhaps better than professors, knew how well that place had been earned. In a burlesque report of an imaginary debate, printed in an early number of the College Magazine, she is referred to under the name "Hypatia," a sort of acknowledgment, perhaps not very appropriate, but still an intelligible acknowledgment of her position among her fellow-students.

From the first it was evident that, although she had no University examination in view, she had planned for herself a very definite and very complete course of study, with a very well defined purpose.

The study of philosophy, undertaken with the object of forming a true theory of life, requires that no branch of modern learning shall be omitted from the necessary preparatory course. Physical and biological science must both be explored. Miss Naden knew this, and accordingly, having determined to build high, she proceeded to lay her foundations deep, submitting to a very thorough drilling in the subject-matter of the sciences of physics, chemistry, botany, zoology, and geology. Then, as in one subject after another she obtained command of the fundamental principles, with no

mean acquaintance with its detail, she transferred her active intelligence, her keen reasoning faculty, and great powers of acquisition, to new ground. No inducements seemed sufficient to prevail upon her to become a mere scientific specialist. For her the absorbing questions seemed to be, What is man, whence and whither?

But though she came to gather for herself the elements of the synthetic philosophy which she thought to pursue as a life-work, she also gave freely of her time and talents to the social life of the College. For some time she served as editress of the Magazine, and was always, till she left England for the East, a chief contributor to its pages. In the first number of the first volume (1883) there is a sonnet of hers, "Hercules." The second number contains an article on "Scientific Idealism;" the next a paper on "Paracelsus." These serve to show the habitually serious turn of her mind, while a couple of pages of verse, under the title "Scientific Wooing," in the third number, provide an example of her sprightly humour, of which other instances are scattered through the later numbers of our Magazine, as well as in the published volumes of her poems. Unfortunately she was obliged to resign the editorship in December, 1884. The last act of what may be regarded as her student life was the composition of the essay on "Induction and Deduction," for which the first award of the Heslop Gold Medal was made. Then came the journey to the East, her illness in India, and return home. Her friends hoped for the best, and looked forward with confidence to the ripening of that noble fruitage of which the spring-time of her life had given promise so abundant. This, however, was not to be. The treasure of this young and ardent life is spilled and wasted; and for those of us who mourn her loss there is no consolation but the memory of the flower that lived but such a little day and then was seen no more.

W. A. T.

PART IV.

"Take the Godhead into your own Being,
And It abdicates its cosmic throne."

Schiller.

A memoir of Miss Constance Naden, as Mr. Hughes and myself agree in thinking, which should ignore the scientific hylo-ideal, or automorphic principle, or synthesis underlying and suffusing her whole intellectual and ethical architectonic, would be like the tragedy of Hamlet *minus* its Protagonist. I shall here state, in as few and clear words as possible, the

data on the furthest rim of her horizon, which coloured and inspired all her utterances, in prose or rhyme; premising that ever since leaving College she had bid adieu to poetry, and was concentrating all her powers for the composition of what she called her *magnum opus*, embodying these esoteric convictions, to which she became a convert while still in her early girlhood—a composition cut short by her premature death. Without this revelation of her inner life much, especially of her later poetry and prose, must be as enigmatical, and indeed incomprehensible, as Volapük. None of her readers, in its absence, will find it practicable to appreciate what the Germans term her *Weltanshauung*, or world-scheme, as regards either the Macrocosm or the Microcosm of Man.

My chief difficulty in this exposition is the elementary *naïveté* and simplicity of the concept, or ideal, involved —the conclusion being more self-evident than any premises leading up to it which I could possibly posit—that conclusion being only common sense, and, indeed, *commonplace* fact, proverbially grander and stranger than all fiction. Her own most explicit utterances of her esoteric faith or unfaith are contained in her essays on *The Brain Theory of Mind and Matter*, on *Hylo-idealism, the Creed of the Coming Day*, in her analysis of Carlyle's genius and of his *Spiritual Optics*, in her critique of Professor Huxley's *Essays on Culture*, in her tract *What is Religion?* and in her German poem, *Das Ideal*, at page 76 of her *Songs and Sonnets of Springtime*, not to mention passages, *passim*, in which, less explicitly, the same world-scheme may be read between the lines. To these writings I beg to direct the attention of all serious students of her life-work solicitous to verify, at first hand, her settled opinions, aspirations, and convictions. All I can pretend to do in this synopsis is to indicate the nature of the *primum mobile*—at once Archimedean *fulcrum* and lever—by means of which she moves, and, indeed, evolves the universe—a principle based exclusively on well-established *data* of Physics, Physiology, and Moral Philosophy. From its far-reaching and exhaustive synthesis, it enables the "Writ of Positive Science" to run in regions, viz., those of Consciousness, in which, as the King's beyond the Highland line during the heritable jurisdiction of the Chiefs, it has hitherto been invalid. It heralds, therefore, a new departure in the provinces of Anthropology and Morals, clearing up *nugæ* that have hitherto ruinously hampered human insight and progress in its highest forms, while yet, as above stated, introducing no new element into the Sphinx-like problem. Its main

coign of vantage, and that, now-a-days, itself quite a truism, is the coherent postulation, on simple and intelligible bases, of the fatuity of Absolute Knowledge, or true Ontology, or Causality, and the assured certainty, or entelechy, of its relativity or individuality—transcendance of which latter, corresponding with the impossibility of *exit* from what Lord Tennyson calls the "abysmal depths" of our personality, being manifestly a *reductio* not only *ad absurdum* but *ad impossibile.*

On this relational ordinance, therefore, unless we are prepared, like Tertullian, to believe just because it is impossible—each individual sentient Being—Beast or Man, Protozoon or Metazoon—must be relatively, *i.e.*, to itself, everything. "Thing," indeed, disappears altogether by transformation into conscious "think," no cognizance of object or *Non-Ego* being possible, until this mental (cerebral) transfiguration from non-egoistic externality into Subject-Egoity is consummated—a fact which is the key of the whole position, and the pivot upon which the mighty question of Auto-Monism *versus* Dualism revolves. This simple fact—simple as any conjuring trick when once we have been initiated into its secret, is clearly one with Kant's negation of the *Thing in itself*, or *Ding an sich.* It is just as clearly *solidaire* with the predicate that each individual sentient being, on the relative or cerebro-ideal plane of ideation, *bien entendu*, is the Maker or Creator, or Demiurge of the only universe—abstract or concrete, visible or invisible, to which it has access. *Quod supra, vel extra, nos* is hylo-ideally, as the only "real reality" or factuality, *nihil ad nos.* All students of ancient Greek wisdom will recognise in this Neo-conceptualism the Gospel of the Abderite sophist, Protagoras, in his own day, though ultimately persecuted, like Phidias, Aspasia, and Socrates, &c., if not literally crucified, for Atheism—acclaimed like Christ—*Logos* and *Sophia;* viz., that man, and, by implication, all other animals, is to himself the measure and standard of all existence and non-existence whatsoever—a formula utterly misunderstood by Plato, Bacon, G. H. Lewes, Grant Allen, Proctor, Tyndall, and generally by most special scientists, our contemporaries. This formula unobscurely affirms that each individual Ego or Self is the creator of its own world: *Faber mundi sui*; and that there are as many worlds as there are *sensoria* to image them—a different world being represented in, and by, every individual brain; constituting thus the veritable apotheosis, canonization, or beatification of universal Humanity, thus revealed as the Surrogate or Vicarius, quite the Pope-King or White Czar, of an

unknowable Pseudo-Deity. Each sentient unit is thus monarchos and autocrat of all it surveys.

All impious presumption—a term Socrates applied to the astronomers of his own time—is eliminated from this Promethean and Titanic escalade—Heaven itself, like all things or nothings else, being but ideal, *i.e.*, a physiological state—an internal feeling, not an external "reality" —when we limit our faculties to phenomena or appearances. Indeed, the charge of presumption recoils on our gainsayers. A world-scheme based on the relativity or phenomenality (*by synecdoche*) of cognition is the really humble view, confining, as it does, human knowledge within its legitimate boundaries, but as a set-off—*the gain being incommensurably greater than the apparent loss*—making man supreme in that his only proper sphere. The real presumption clings thus to the Spiritualists, who seek to know, and assume to know, the unknowable and unverifiable. To search after the unsearchable, with which we have no real concern whatsoever, is self-evidently "vanity of vanities." It is like the futile efforts of the infant in arms to clutch the moon, or like attempting to jump down our own throat, out of our own skin, or to run from our own shadow. The real humility is to foreclose all pretensions to reach *veræ causæ* as entirely beyond the necessary limitations of the human mind (brain), and to rest content in the relativity of all *Gnosis*.

In modern times Bishop Berkeley's *Principles of Human Knowledge* is the *réchauffé* of the Abderite sophist's standpoint, as Spinoza's *Pantheism* of the later Platonist Theocles, only the former, vitiated by the dual fallacy of the Absolute, from which Animism or Fetichism—a vicious relic from primeval medicine men—the Greek hylo-zoists who preceded Plato were exempt. Our christian and episcopal Protagoras enunciates his "Principle" thus: "Some truths there are so near and obvious to the mind that a man has only to open his eyes to see them. Such I take to be this most important one, that all the choir of Heaven and furniture of earth—in a word, all those bodies which compose this mighty frame of the world, have not any substance without a mind." This position, unlike Mr. Gladstone's "Rock of Holy Scripture," is impregnable. But, since out of our own cerebration we can never expatiate, that pseudo-alien mind can be no other than *our own*—the "unknown" Cause of Causes, therefore, which we blindly "seek after," and when hypothetically "found" assume to worship, being impossibly any other "making for righteousness," or the reverse, than the Pseudo-Deus-Homo, Ego, or Demiurge, our *Very Self of Very Self*. In a tract

published at 63, Fleet Street, in 1887, entitled *Humanism v. Theism*, I have dwelt more fully than I do here on the bearing of this auto-centric Solipsism on Eschatology. This tract consists, in addition to her essay on Hylo-Idealism, of extracts from letters addressed to Miss Naden, selected by herself, during the years 1878-80. They are prefaced by a note of her own stating that, after further verbal illustration, and after study of the exact and moral sciences, she became a convinced convert to this world-scheme. Berkeley's plea for Absolute Idealism appeared in 1708, more than 180 years ago. In that interval what stupendous experiential developments, which at bottom are all mental, have taken place. Scotch Moral Philosophy from Hutcheson to Hume and Thomas Brown, of which Kantism is an offshoot, German Rationalism dating from Lessing's Wolfenbüttel Fragments (1774—78), the neology of modern philological exegesis, and last in order, but first in rank, the amazing evolution of the Positive Sciences, not one of which existed in 1708, with the exception of formal or ideal Newtonian Physics, and its application to Astronomy. Even that whilom Queen of the Sciences, now dethroned by "transcendental" Anatomy, required the revision of Laplace and other French Neo-Materialists, to get rid of the immaterial extra-mundane Spiritism which vitiated its conclusions in the domain of Philosophy. No competent astronomer, now-a-days, but must smile at Sir Isaac's *scholium* about the *Ens Supremum*. It is quite on a par with Milton's mythology of Creation. Medicine, in Berkeley's age, and till the end of the eighteenth century, was quite in the scholastic stage. It only entered the Positive phase under the genius of Xavier Bichat, who, like the subject of this memorial sketch, was cut off prematurely at the age of thirty-one years. The Bishop's delusion as to the "virtue of tar water," which, during almost his entire lifetime, he extolled as the "*infallible*" prophylactic and panacea for all diseases of animals and vegetables, is proof sufficient of the backwardness of the healing art, as well as of his own visionary disposition and complete incapacity for valid experimental research. *Mutatis mutandis*, like Dean Swift, he was, in Thackeray's words, "strangled by his own [clerical] bands."

All such minds are, as fetichists, *dualists*, who *must* hold animal Life to be the union of Soul and Body—a now quite antiquated and anti-scientific position, fundamentally one with the Archeism of Van Helmont, a Flemish nosologist, who died soon after Newton's birth. Now-a-days

Monism—unity of body and mind—which defines sentient vitality as organic function, or organization in action, is the accredited creed of Science. That histological canon holds a separate soul or spirit, or *Noûs*, to be in Physiology what Phlogiston or Caloric is in Chemistry and Physics—an imaginary factor or Nonentity. This thesis is well expressed by the late Sir Wm. Gull, M.D., in the sentences: "Until to-day [or rather yesterday] the theory that the living quality in us was due to a mysterious vital force [*i.e.*, immaterial spirit or principle] out of reach of science, pre-occupied the mind and stood in the way of observation and experiment. But now it has become the immovable standpoint of Physiology that a living creature is dependent for all its bodily functions upon the forces of inorganic matter; or, in other words, that our corporeal life is but the operation of material atoms and material forces within the reach of experimental enquiry."

Indeed, how can this be any longer a question, since the solidarity of the organic and inorganic was set at rest by Wöhler's transmutation of the one into the other by his artificial manufacture in the laboratory of the organic product *Urea* from inorganic ones, more than sixty years ago (1828)? So that now-a-days organic chemistry is only that of the carbon compounds. One step further, but that an epoch making, all shattering one, reversing past and present authoritative notions of human Ethics and Practice, Miss Naden takes, when she resolves Hylozoism into Hylo-idealism, of which the somatic Self is centre, radius, and periphery. As must be the case if all our knowledge be only an Autopsy, or Self-inspection—a thought-world and thought being an alias of cerebration, as impossible of vicarious or altruistic performance as sleep or alimentation. The mere affirmation that the Brain is *sensifacient*, or sense and mind creating, solves the whole immemorial problem, which in all ages and climes has maddened the hitherto only semi-rational family of Man in doubt whether to deem himself a God or Beast. Most seem quite content with being the latter or worse. And until the human race can be made to realise, and act upon the fact, that each of its units is its own measure and standard no progress worth the name, but only processes of alternate action and reaction, can, in the way of Self- and world-reformation, come to pass. Wanting this criterion of truth and untruth, the extension of Luther's plea for Private (individual) Judgment and liberty of conscience, human nature must remain indefinitely what Pope describes

in the 2nd Epistle of his *Essay on Man*, from the line "Know then thyself, presume not God to scan," to the couplet:

> "Sole Judge of Truth, in endless error hurl'd,
> The glory, jest, and riddle of the world."

Make "thing" only think or idea—an Ideal Pope vigorously and virulently combats and denounces in the 4th Book of the *Dunciad*—and the whole standing problem, usually pronounced insoluble, including the origin of "Evil," Determinism and Indeterminism, etc., is disentangled at one blow, like the Gordian Knot by the sword of the Macedonian conqueror. "Our Universe," writes Miss Naden, at page 10 of *Humanism v. Theism*, in one of many passages to the same effect throughout her writings, "is made up of sensations [or states of consciousness]. For even thought is but the special sense of the cerebral cortex, and beyond sensation we cannot pass. Even *Hyle*, the substance, the Unknowable, if you will, must be defined in terms of thought. * * Practically we may say of Self, as Paul of Christ: In it are all things created in the Heavens and upon Earth, things visible and things invisible; all things have been created by it, and Self is before all things, and in Self all things consist." Of course this is the Gospel of Selfism, far as the poles asunder from vulgar Selfishness and Egotism. Lord Byron hails Berkeley's theory as a "sublime discovery," from its making the Universe universal Egotism, or rather Egoism. And the above quotation from Miss Naden converts this speculative dream into a sober, scientific excogitation not possible in his age. It quite corresponds with Sir Humphry Davy's ejaculations during the orgasm induced by Nitrous Oxide Gas: "Nothing exists but thoughts. The Universe is composed of impressions, ideas, pleasures, and pains." And when, quite restored to his normal condition, he describes himself as "by degrees losing all connection with *external* things, and as existing in a world of newly connected and newly modified ideas, and as seeming a new and sublime being, newly created." The Stoic and Christian Palingenesia, Pentecostal descent of the Paraclete, and all analogous raptures or *En*stases of Saints and Martyrs, "raising their longing eyes on high as though it were a bliss to die," can be nothing else than this hyper-neurotic condition of the supreme nerve centres, and therefore a natural physiological phenomenon. The ecstatic or enstatic rhapsody of the emancipated Baccalaureus in Part II. of Goethe's *Faust*, translated by Miss Naden at page 173 of her *Modern Apostle*, and the quasi-divine vision of her Modern Apostle himself, on which she—through the medium of Ella—throws cold water, to say nothing of Calen-

ture, Mirage of the Desert, and other cognate physiological states, are all instances of the same cerebro-cosmic exaltations, and Mount Tabor-like transfigurations.

Fichte's announcement at the close of one of his lectures at Jena, "Gentlemen, to-morrow I shall create God," and Schiller's lines in his *Life and the Ideal*, "With Man's resistance [to Reason] vanishes also the Majesty of God," all bear witness to the fact that percepts and concepts—emanations of the Self—form our entire universe. So that, instead of being the offspring in the domain of Consciousness, outside which is *taboo*, we really are the Parent of Deity.

On that neo-nominalist world-scheme—a view thoroughly verified by the records of all Religions from Serpent Worship to Jehovah, Jove, or Lord Jesus—Divinities are made in the image of their worshippers, not *vice versâ*. Autocentric Solipsism is well illustrated by the Brahman saying that "Brahm looking round can see nothing but himself," or, to come nearer home, by the inscription on the monument of Sir Ch. Wren, in St. Paul's Cathedral, "*Si monumentum quæris circumspice*;" or by what ought to have been the answer of the Neo-Materialist savants to Napoleon on the passage to Egypt, when he extended his arm to the Orient Stars, and fancied to foil them by asking who made all that. The real answer, on this plane of thought, ought to have been: "*Yourself. What you see is a vision of your own.*" Later in life he objected to Laplace's exclusion of Divinity from his system, to which the great geometer replied, differing thus *in toto* from Newton: "I have no need for that supposition." I hope I have now made the philosophical esoterism of Miss Naden intelligible to all—never numerous, especially in un-ideal England—serious enquirers. It may all be summed up in the postulate that perception and conception, or, in one word, Thought or Idea, is an organic function, which, like all other natural offices, every one must perform for himself. To him, or her, who realises this necessity, the whole burden of my exposition is clear. *Egomet ipse* must be the universal "I am." When Bacon blames men for spinning webs, like spiders, out of their own entrails, he failed utterly to see through the problem. Man can do nothing else. The cerebral cortex is a *viscus*, and out of it proceed the issues of life and death, or what is the same, our consciousness of the former, of which the latter is only the privative. To myself the above canon covers the whole position. But, before closing, I may append additional concrete anatomical evidence, extracted from Dr. R. A. Lundie's recent contributions to the more recondite optical Anatomy, under

the article "Eye," in Chambers' Encyclopædia, or Dictionary of Universal Knowledge. In that enlightened, and up to date, monograph, Dr. Lundie writes: "In vision we do not look outwards towards the object, but inwards only, towards the object as mirrored [*i. e.*, manufactured] at the base of our own eye; the essential factors of vision—the rods and cones of the bacillary layer of the retina or Jacob's membrane, which are present by millions, being thus turned away from the light." This seems a perfect physical proof that the quasi-outer, or objective world, so far as we can or need see, is only an individual and subjective image of what Locke calls "*I know not what*," formed at the bottom of our own optical apparatus." I quote Chambers's Cyclopædia as a popular and accessible work of reference. The same morphological proof of automorphic Monism is more fully elaborated in Sir John Lubbock's *Senses of Animals* (International Scientific Series), and in other recent handbooks dealing with this crucial problem. The reflected image on the retina, *corrected by the "Mind,"* points the same moral, that all we see is but an Autopsy. Kepler's *Supplement to Vitellio* is no satisfactory *rationale* of the puzzle; no "explanation" of an ultimate fact being possible or necessary. It is entirely *ultra vires rationis (cerebri)*, and therefore, in sound science, quite out of court.

R. L.

MR. HERBERT SPENCER'S SEVENTIETH BIRTHDAY.

At the cxxxvi[th] meeting of the Sociological Section of the Birmingham Natural History and Microscopical Society, held at the Mason College, on Tuesday, 6th May, 1890, the following correspondence was read, and ordered to be entered on the minutes of the meeting:—

"To Herbert Spencer, Esq.

"SIR,—We, the undersigned, past and present members of the Sociological Section of the Birmingham Natural History and Microscopical Society—and other friends who have assisted at the meetings—having been for several years pleasantly and profitably associated together in the study of your Synthetic Philosophy, desire to congratulate you on the attainment of the full measure of seventy years of life. We rejoice to know that, notwithstanding the severe and continual strain on heart and mind which your unique and magnificent labours have involved, you are still giving to us, to the world, and to posterity, words of grace and wisdom.

It has pained us to find from time to time that some of those who do not altogether agree with your views, have expressed these partial disagreements in unnecessarily hard terms. We are sure that when your teachings are fully understood, they will be found to be neither harsh nor unmerciful, but if in any particular they should be found to fail of the fullest justice and benevolence, they will to that extent fall short of your intention and design.

We often refer to the Preface to your "Data of Ethics," and we do not fail to remember that it has been in the spirit, and with the objects therein indicated, that the construction of your great system has been essayed.

In the earnest hope that you may still enjoy years of comfort and of work, and that your own consciousness of noble and good intent will be your sufficient support at all times,

We are, Sir,

Your faithful servants,

W. R. Hughes, F.L.S., *President of the Section.*
Herbert Stone, F.L.S., *Hon. Sec. of the Section.*
W. B. Grove, M.A., *Vice-President of the Society.*
William P. Marshall, *Hon. Sec. of the Society.*
W. H. Wilkinson, *Hon. Sec. of ths Society.*
J. Rabone, *Hon. Sec. of the Society.*
H. W. Crosskey, LL.D., F.G.S., *Late President Birmingham Philosophical Society.*
C. H. Allison.
Edward W. Badger, F.R.H.S.
James E. Bagnall, A.L.S.
Alfred Browett.
Isabel Browett.
Harold W. Buncher.
Annie G. Byett.
F. J. Cullis, F.G.S.
Mary E. Dalton.
Jane Kerr Davies.
G. R. Farncombe, M.A.

Lawson Tait, LL.D., *Bailiff and President of Council of Mason College.*
J. H. Poynting, Sc.D., F.R.S., *Professor of Physics, Mason College.*
Wm. A. Tilden, D.Sc., F.R.S., *Professor of Chemistry, Mason College.*
C. Lapworth, LL.D., F.R.S., *Professor of Geology, Mason College.*
W. Hillhouse, M.A., F.L.S., *Professor of Botany, Mason College.*
F. J. Allen, M.A., *Professor of Physiology, Mason College.*
John Berry Haycraft, B.A., B.Sc., F.R.S.E., *Assistant Professor of Physiology, Edin. University.*
Lilie A. Goyne.
W. Greatheed.
M. E. Grove.
Alfred Hayes, M.A.

WILLIAM L. HIEPE, Ph.D.
ALFRED HILL, M.D., F.I.C., *Medical Officer of Health, Birmingham.*
J. ALFRED HILL, F.R.M.S.
EDWIN HILL.
EMILY HUGHES.
WM. MATHEWS, M.A., F.G.S.
AMELIA MOSELEY.
KINETON PARKES.
MARGARET KINETON PARKES.
HOWARD S. PEARSON, *Lecturer on English Literature, Midland Institute.*
SHOWELL ROGERS, M.A., LL.D., Cantab.
H. H. SPEARS.
JOHN SPENCER.
SAM. TIMMINS, J.P., F.S.A.
COLBRAN J. WAINWRIGHT.
J. CUMING WALTERS.
S. D. WILLIAMS.

The Mason Science College, Birmingham,
27th April, 1890.

64, Avenue Road, Regent's Park,
London, N.W., April 29, 1890.

DEAR MR. HUGHES,—Of the many congratulations, home and foreign, which I have received on the attainment of my seventieth birthday, there is not one which has given me so much pleasure as that which you have forwarded to me as a joint expression of sympathy from the members of the Sociological Section and their friends.

The consciousness that those who have signed this letter of good wishes have intended to express their appreciation of my aims and efforts gives me much pleasure; and it is especially gratifying to find in the list so many distinguished names.

Very generally men who have devoted themselves to philosophy have had to struggle on through life with but little recognition, leaving what value there was in their works to be discovered after their deaths. To me has come a better fortune. Few, if any, who have followed kindred careers have met with so much recognition from their contemporaries.

Though at present suffering from a relapse, I have reason to think that it will not be a serious one, and that I may presently resume the hope which I have lately been entertaining that I may be able to do a little more of the work which I many years ago marked out for myself.

Please communicate this expression of my thanks to the members of the Section, and those who have joined in their congratulations, and believe me,

Very truly yours,

HERBERT SPENCER.

THE ORIGIN OF DECORATIVE ART AS ILLUSTRATED BY THE ART OF MODERN SAVAGES.*

BY HENRY BALFOUR, M.A., F.Z.S.

(Continued from page 110.)

The art of decoration was without doubt in the first instance suggested to the mind of man in simple ways of this kind, and its origin should be referred back to the time when first man's æsthetic appreciation of peculiarities, either natural or produced as accidents in manufacture, was sufficiently developed to suggest the application of artificial means in order to increase their effect; in other words, to control them to serve the special purpose of ornament.

The first stage in the development of decorative art is purely what may be termed an "*adaptive*" stage, that is, man simply accepts and adapts an effect which is accidentally suggested to him. But in the second stage, when an endeavour is made to produce artificially a similar effect, in imitation of the natural one, a "*creative*" operation of the intellect is required. We have here the rudiments of copying, which is the means whereby all conventional or fanciful ornament of savage peoples has doubtless been produced.

With a highly skilled artist it is no difficult matter to make a copy of some simple object or pattern, which shall so resemble the original as to be hardly distinguishable from it. With uncultured savages (and so we must believe also with primæval man) it is different. In unskilled hands, and with indifferent tools, accurate copying is an impossibility; and each new attempt at representing an object creates variations from the original type. Suppose, for example, that someone, whom I will call A, copies an object; and B copies from A's version of it, without having seen the original; and C from B, and so on; in each case the new copy varies from the preceding one more or less according to the skill of the artist. We can see that in the course of time patterns can thus arise, which may by such successive copyings entirely lose all resemblance to the original object, and A's would be a realistic version of it. I have in my possession an example, not from savage life, which illustrates this point. An original drawing of my own, representing a snail crawling over a twig, was given out to different people to be copied, as I have described. In each case I only gave the last copy of the series as it grew to the person who was to do the next sketch. In a series of 12—15 copies thus

obtained, the snail's shell gradually leaves the snail and becomes a kind of boss upon the twig, and finally the design is turned upside down; the artists at this stage being convinced that the sketch is intended to represent a bird, the "horns," of the snail having become the forked tail of the bird. It is seen that the extremes of the series are absolutely unlike each other, but in no case are any two adjacent sketches very dissimilar.* In savage art examples of this kind of evolution in design frequently occur.

Thus, in the early condition of man's culture, conventional design has been to a very great extent *unconsciously* evolved from realistic representation, and the passage from the one to the other has been made by easy stages.

This unintentional variation of designs is, however, frequently, if not usually, accelerated by another process, which I may call "*conscious variation*," that is, the desire to improve upon the design copied. This, as a rule, results in some particular portion of the design being specially emphasized, and made thus to develop gradually at the expense of the remainder. Countless examples of this can be seen in savage as in civilised art.

In this case the cause of the variations seems to be due merely to caprice on the part of the artists, wilful tampering with the design, with no special motive beyond increasing the ornamental effect, unless it be for the purpose of creating slight differences to act as marks of ownership. But occasionally there is a definite reason for emphasizing some particular portion of a design. That portion may have some special meaning which renders it the most important part of the design. In reproducing the design again and again the tendency would always be to make the most of this important detail, and the rest of the design would tend to sink into insignificance before its encroachments, and perhaps disappear altogether, leaving the principal feature master of the field. I will give an instance of this. The carved ceremonial staves carried by the Maori chiefs of New Zealand, have almost invariably at their upper ends a carved grotesque representation of a human head, with large mouth and enormously protruded tongue. The *raison d'etre* of this design lies in this protruded tongue, which among the Maori warriors indicates defiance, an important emotion amongst a warlike people! In a few examples of these staves the head is represented in profile, though the tongue is invariably "full face," thus

* This method of treating designs was suggested to me by General Pitt-Rivers, who has collected some very curious examples of series of this kind.

illustrating the lesser importance of the face portion of the design. This is further exemplified in some other specimens, in which the face has been entirely suppressed, leaving nothing but a huge tongue, whose meaning would be by no means apparent without comparison with the other specimens.

In spite of the tendency to vary, and the reasons for varying designs, one of the prominent characteristics of savage art is the persistent manner in which certain *types* of design are adhered to. The savage has always been described as obstinately conservative, and evidences this propensity in his customs, implements, and general mode of living. In the treatment accordingly of decorative art certain types are established in certain regions, and, however numerous may be the variations, all these will be referable to a few "root" designs, so to speak, which are characteristic of the particular region.

In this way each savage nation develops its own special style, or what we may call its "school." The same kind of object will be ornamented with the same kind of ornament, which, though varying slightly in detail in nearly every example, will continue to be fundamentally the same in idea from generation to generation. On this account it is generally possible to decide the locality whence an object has come with no other data to direct one than the character of its ornamentation.

In the decoration of useful objects, weapons, tools, and the like, as the ornamentation has, in its earlier stages at least, been influenced by, if not directly suggested by, the shape or function of the object, it is usually admirably adapted to the latter, and we find a true balance of ornament with form. This applies equally well to the beautiful designs employed by savages in "tattooing" their bodies. It is a fundamental principle which is too often lost sight of even in the most finished works of periods of decline, or false art, as in countless instances of modern pottery and porcelain, etc.

Per contra, it must be said that frequently associated with very elaborate decoration is the degeneration of the utility of an implement. By this I mean that among those savage peoples, who are much addicted to the use of elaborate fanciful decoration, the application of such ornamentation to useful implements is often carried to such an extent as to render these unfit for use, and they thus become reduced to, or "glorified" into, mere ceremonial or processional emblems. The natives of the Hervey group, who till recently used stone bladed adzes for their woodwork, have applied carved ornamentation to the handles of many of these, and frequently the

handles are so large and so elaborately carved as to render the adzes quite useless, though they have become very beautiful pieces of workmanship. These are kept as purely ceremonial emblems of authority, after the manner of our own state and civic maces.

In studying the origin and characteristics of savage art it is convenient to separate sculpture, or solid representation, from outline delineation, although the two forms, especially in their early history, are so nearly allied. It is generally allowed that sculpture was probably the earliest means employed for representing such natural objects as animals and men; outline drawing upon flat surfaces being of subsequent invention. Man, long before the art of decoration entered into the category of his accomplishments, was already familiar with fashioning the forms of his tools in various materials, and was therefore well acquainted with the working of rough materials into desired shapes. It is moreover certain that to the uneducated eye a solid object, representing some familiar thing, appeals far more readily than an outline drawing of the same, as the latter leaves so much to the imagination, and requires therefore a greater intellectual effort to grasp.

The creation, therefore, of the germ of realistic art may be said to have taken place when Man's attention was first drawn to the accidental similarity of some natural or artificial object to some well-known form, such as that of a familiar animal, for example. As I have before said, there is far more reason to believe that art owes its origin to accident in this manner than that it is the direct outcome of the intelligence, the application of matured reasoning.

(To be continued.)

THE FUNGI OF WARWICKSHIRE.

BY W. B. GROVE, M.A., AND J. E. BAGNALL, A.L.S.

(Continued from page 228, Vol. XII.)

Sub-genus XXXII.—Psilocybe.

271. **Ag. sarcocephalus**, *Fr.* Very rare in England. At base of trunks, Crackley Wood, Kenilworth, Sep., 1885, *Cooke, Illustr.*, pl. 620.
272. **Ag. ericæus**, *Pers.* Pastures; rare. Aug.-Oct. Field, Birmingham Road, Kenilworth, *Russell*, *Illustr.* Sutton Park, Oct., 1883, *Cooke*, Trickley Coppice.
273. **Ag. udus**, *Pers.* Boggy places. Rare. Sept. Sutton Park; New Park, Middleton; Coleshill Pool; Wyndley Pool; Trickley Coppice; Four Oaks.

274. **Ag. areolatus**, *Klotsch.* Gardens. Rare. Sept. Stoneleigh, 1872, *Perceval.*
275. **Ag. atro-rufus**, *Schæff.* Very rare. Amongst grass, Wyndley Pool, Sutton, Dec., 1884. "Differing from the type in the attachment of the gills, and perhaps somewhat doubtful. I have found exactly the same species on the Rowley Hills, Staffordshire. It is figured from the Sutton specimens in Cooke, Illustr., pl. 571." —W. B. G.
276. **Ag. Comptus**. *Fr.* *Ag. comptulus*, Russell. Crackley Wood, Kenilworth, May, 1872, *Russell, Illustr.* Wainbody Wood, Stoneleigh.
277. **Ag. semilanceatus**, *Fr.* Pastures and grassy footways, Warwick, *Perceval.* Kenilworth, *Russell, Illustr.* The Fields, near Ansty, *Adams.* Sutton Park; Middleton Heath; Trickley Coppice; Maxtoke; Crackley Wood, Kenilworth; Langley; Coleshill Heath; Edgbaston; Corley; Kingswood; Grove Park.
278. **Ag. spadiceus**, *Fr.* Woods, &c. Frequent. Oct. Dale House Lane, Dunn's Pits Lane, Burton Green Wood, Kenilworth, *Russell, Illustr.* Trickley Coppice; New Park; Maxtoke; Coleshill Heath; Packington; Sutton Park; Umberslade.
279. **Ag. cernuus**, *Müll.* Kenilworth, *Russell, List.*
280. **Ag. fœnisecii**, *Pers.* Amongst grass. *Ag. rubiatus?* With. 278. Aug.-Sept. Lawn, Clarendon Villa; Dunn's Pits Lane, Kenilworth, *Russell, Illustr.* The Fields, near Ansty. *Adams.* Aston Park; Bannersley Pool; Coleshill Heath; Packington Park.
281. **Ag. clivensis**, *Berk.* Dunn's Pits Lane, Kenilworth, *Russell, Illustr.*

Sub-genus XXXIII.—Psathyra.

282. **Ag. conopileus**, *Fr.* Gardens. Rare. Aug. Garden, Clarendon Villa, Kenilworth, *Russell, Illustr.*
283. **Ag. mastiger**, *B. and Br.* Waysides. Sept.-Oct. Hopsford, near Brinklow, *Adams.* Footways, near Trickley Coppice, Oct., 1883, *Cooke.*
284. **Ag. corrugis**, *Pers.* *Ag. corrugatus?* With. Pastures. Sept., Oct. Packington Park, *With.*, 278. Pastures, Kenilworth; meadows by the Castle, Kenilworth, *Russell, Illustr.* The Moats, Ansty, *Adams.* Sutton Park; Old Chester Road; New Park; Marston Green; Corley; Edgbaston.
285. **Ag. spadiceo-griseus**, *Schæff.* Aug.-Oct. Ditch, among dead leaves, Parkfield, Kenilworth, *Russell, Illustr.* Trickley, Sept., 1883.

286. **Ag. obtusutus**, *Fr.* On the ground. Rare. June. Crackley Wood, Kenilworth, June, 1872, *Russell, Illustr.*

287. **Ag. fibrillosus**, *Pers.* Woods. Rare. Oct. Crackley Wood, Kenilworth, *Russell, Illustr.* Westwood Coppice, Sutton Park; New Park; Corley.

288. **Ag. pennatus**, *Fr.* On soil. Rare. Oct. School Rough, Marston Green; Lady Wood, Four Oaks.

289. **Ag. gossypinus** *Bull.* Woods. Rare. Crackley Wood, Kenilworth, May, 1872, *Russell, Illustr.*

Sub-genus XXXIV. PANÆOLUS.

289. **Ag. separatus**, *Ag. semi-ovatus*, With. On dung. Frequent. Aug.-Nov. Warwick, *Perceval.* Kenilworth! *Russell, List.* Gardens and fields, Ansty, *Adams.* Sutton Park; Coleshill Heath; Stoneleigh; Packington Park.

290. **Ag. leucophanes**, *B. and Br.* Grassy fields. Sept. Aston Park, 1883, *Cooke.*

291. **Ag. fimiputris**, *Bull.* Fields and pastures, on dung. Not rare. Oct. Meadow near the Castle, Kenilworth! *Russell, Illustr.* The Fields, near Ansty, *Adams.* Sutton Park; Trickley Coppice; New Park; Edgbaston; Packington Park.

292. **Ag. phalænarum**, *Fr.* *Ag. semi-ovatus, var.* 2. With. On dung. Sept.-Nov. Edgbaston Park, *With.*, 291. Hot beds and fields, Ansty, *Adams.* Aston Park, 1883, *Cooke.* Packington Park.

293. **Ag. retirugis**, *Fr.* On dung. Oct. Manure heaps, Dunn's Pits Lane, Kenilworth, *Russell, Illustr.* Lady Adams' Garden, Ansty; Brinklow Lane, *Adams.* New Park, Middleton. Trickley Coppice.

294. **Ag. campanulatus**, *L.* Fields. Not rare. Sept.-Oct. Field near Kenilworth, *Russell, Illustr.* Field, Ansty, *Adams.* Causton, *Rugby School Rep.* Crackley Wood; Water Orton; Coleshill Pool; Sutton Park; Edgbaston; Four Oaks; Packington Park; Trickley Coppice; Bradnock's Marsh.

295. **Ag. papilionaceus**, *Fr.* Cultivated land. Sept. Red Lane, Kenilworth, *Russell, Illustr.* Combe Fields, *Adams.* Kingsbury; Sutton Park; Packington Park; Marston Green.

296. **Ag. acuminatus**, *Fr.* On dung. Very rare. Sutton. "I was formerly inclined to call this *Ag. fimicola*, but on comparison with Cooke, Illustr., pl. 632, I am convinced that it is *Ag. acuminatus.*"—W. B. G.

297. **Ag. gracilis**, *Fr.* Amongst grass by waysides. No doubt frequent, but overlooked. Warwick, *Perceval.*

Sub-genus XXXV.—PSATHYRELLA.

298. **Ag. pronus**, *Fr.* Amongst grass. Oct. Meadows behind Kenilworth Castle, *Russell, Illustr.*

299. **Ag. atomatus**, *Fr.* Dunn's Pits Lane, Kenilworth, *Russell, Illustr*, Ansty! *Adams.* Solihull; Edgbaston Park.

300. **Ag. disseminatus.** *Fr.* *Ag. minutulus*, With. On old trunks of trees. Oct. In Lord Aylesford's Park at Packington! *With.* On old stumps, Ansty, *Adams.* Lawn, Clarendon Villa, Kenilworth, *Russell, Illustr.* Sutton; Water Orton.

(To be continued.)

Review.

The Flora of Suffolk, by Rev. W. M. HIND., LL.D. 508 p., Map. London: Gurney and Jackson, 1889.

THE gaps in our list of county Floras are rapidly being filled up, and we must heartily congratulate Dr. Hind upon the completion of the Suffolk Flora, and on the excellent manner in which the work has been accomplished.

The Introduction gives first, a description of the Natural Features of Suffolk; second, an Outline of the Geology of the County; third, the Climate; fourth, the Rainfall (the latter three being prepared by Dr. Wheeton Hind); fifth, the Distribution of the Species in Suffolk. This introductory portion occupies thirty-four pages.

Then follows the flora proper, which adopts the arrangement of species employed in the eighth edition of Babington's "Manual." Synonyms used in the London Catalogue, or Hooker's "Student's Flora" are generally inserted and printed in italics. For botanical purposes the county is divided into five portions, Nos. 1 and 2 being almost identical with the West Suffolk of Top. Bot., and 3, 4, and 5 with the East Suffolk of the same work. The name of the earliest recorder is also given; as is reference to the pages in the Manual where the species is described, also whether tree, shrub, or herb, its duration, character of soil on which it occurs, and the usual flowering period. A list of books, MSS., and helpers is prefixed.

There are a few pages on Palæontological Botany, giving a list of species found, which includes *Trapa natans*, *Salix polaris*, *S. Myrsinites*, *Betula nana*, *Pinus sp. Pinites succinifer*, now absent from the county. *Eleocharis palustris*, Br. (not Linn as given), and *Carex paludosa* are included on the evidence of a single fruit of each species.

A tabular view of plant distribution through the five divisions of Suffolk and the border counties of Essex, Cambridgeshire, and Norfolk follows, but we should have liked to have seen the results of this tabulation appended.

A comparison of the Flora of Suffolk and the three adjoining counties with the Flora of Holland is given, from which it appears that the East Anglian species are estimated at 1,339, and those of Holland at 1,466. Of these 1,120 are common to the two countries. The following Eastern Counties species are not recorded for Holland:—*Arenaria leptoclados, Lathyrus hirsutus, Peucedanum palustre, Galium Vaillantii, Diotis maritima, Verbascum pulverulentum, Melampyrum cristatum, Chenopodium botryodes, Statice caspia, Actinocarpus Damasonium, Potamogeton trichoides, Lastrea uliginosa, Fumaria parviflora, F. Vaillantii, Ulex nanus, Trifolium suffocatum, Verbascum virgatum, Veronica spicata,* and *Ophrys aranifera.*

Muscari racemosum in Suffolk is represented by *M. botryodes*, and *Frankenia lævis* by *F. pulverulenta* in Holland.

Twenty pages are devoted to an account of the progress of botanical study in Suffolk, which, despite the modest reference to it in the preface, is excellently done.

The book is printed in a bold but not altogether pleasing type, and is fairly free from misprints. The writer, Dr. Hind, has fallen into an error in the endeavour to avoid ungrammatical Latin, and written the varietal names with the initial letter of the genus before them as if they were species, or rather as if the authority who described them had named them as species; for instance, under *Ranunculus Flammula*, is given "form *R. pseudo-fluitans*, Syme," the fact being that Syme described it as *var. pseudo-fluitans.* Under *R. acris*, L., var. *R. tomophyllus*, Jord. is correct, for Jordan described it as a species, and Dr. Hind follows general custom in reducing it to a variety; so, too, quite correctly is given *R. parvulus*, L., under *R. hirsutus*, Curt., but the older name is *R. sardous*, Crantz, quoted here as the synonym. As instances of the errors may be noted *Polygonum pseudo-dumetorum*, Wats. He only described it as a variety.

No attempt has been made to bring the nomenclature into more thorough accordance with recent ideas, as perhaps it was felt that it would be embarking on a perilous voyage; but we shall have to face the journey, and the sooner it is attempted the better.

A few of the authorities for plant names (for which Dr. Hind is not solely responsible) are erroneous. For instance, Linnæus is not the authority for *Alyssum maritimum*, since he described it as *Königa*; nor is Besser the authority for the white variety of our *Viola odorata ;* Besser's *V. alba* is a different species. *Reseda luteola* should be *R. Luteola. Saponaria Vaccaria, Radiola Linoides, Potentilla Anserina, Circæa Lutetiana, Scabiosa Succisa,* and *Stratiotes Aloides* require capital letters to the trivial or specific name. *Trifolium ochroleucum*, Linn, should rather be *T. ochroleucon*, Huds. *Potentilla Tormentilla* has no

authority. An older name is *P. silvestris*, Neck. *Bryonia dioica* should be Jacq., not Linn., and Pollich is the authority for *Valerianella dentata*. *V. mixta* should be Dufr., not Duxe. Hudson, not Linnæus, is the authority for *Dipsacus silvestris*. Hudson wrote *Rumex Hydrolapatheum* for the great Water Dock. *Trisetum pratense*, Pers., precedes *T. flavescens*, Bea., and *Hordeum marinum*, Huds., should take the place of *H. maritimum*, With.

Senecio crassifolius, Willd, is given as a variety of *S. vulgaris*, L. Until it has been proved to be a hybrid we should have given it specific rank. It occurred as a casual only, we presume. The writer found near Wangford some plants of *Erythræa Centaurium*, Pers., somewhat intermediate with *E. littoralis*.

We should think the statement that *Callitriche vernalis*, Koch., is common in all the districts, if applied to the restricted plant, is questionable.

Does not Parkinson's *Clinopodium minus sive vulgare*, from Thetford, in Norfolk, really belong to this county? We do not see Gerarde quoted for *Spartium anglicanum*, and instead of *Astragalus glycyphyllus* (in the sketch of Suffolk Botany), Gerarde is quoted for *Hippocrepis*, which he does not record as a Suffolk plant. In the Flora proper, Gerarde's *Astragalus* record is also given to *Hippocrepis*. *Neottia Nidus-Avis* was first given, we believe, in Ray's Historia, as well as some other Suffolk plants.

The mosses and lower cryptogams still require cataloguing.

As we have said, very hearty congratulations must be given Dr. Hind for his capital Flora. When shall we have such an one for the border county?

G. Claridge Druce.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—General Meeting. April 29. The President (Mr. C. Pumphrey) in the chair. Mr. W. B. Grove, M.A., exhibited, for Mr. W. H. Wilkinson, the following fungi from Corwen:—*Puccinia umbilici* (rare), *Œcidium ficariæ*, and *Hirneola auricula-Judæ*. Mr. W. B. Grove, M.A., gave the retiring President's address on "The Theory of Instinct," reviewing its history from the time of the early philosophers to the finest and most recent statements of Mr. Herbert Spencer, and the whole subject was treated in a most thorough and masterly manner. The address was listened to with great attention and interest. A discussion ensued, in which the following gentlemen took part:—The President, Messrs. W. R. Hughes, W. P. Marshall, J. Udall, J. Clarke, C. Wainwright, and W. H. Wilkinson. A hearty vote of thanks was accorded to Mr. Grove, coupled with a request that he would allow it to be printed in the "Midland Naturalist."—Microscopical Meeting. May 6. Mr. W. P. Marshall, M.I.C.E., in the chair. Mr. Geo. Lavender exhibited, under the microscope, living specimens of *Melicerta ringens* and *Hydra fusca* from Sutton Park.

Mr. W. H. Wilkinson exhibited *Fritillaria meleagris*, the Snake's Head Lily, from Oxford; also the following birds from Corwen, Wales:—*Loxia phyrrhula*, bullfinch; *Fringilla cœlebs*, chaffinch; *Emberiza citrinella*, yellow-hammer; and *Parus major*, the long-tailed tit. The report of Mr. E. Burgess on the foraminifera obtained at Hammerfest, by Messrs. Pumphrey and Marshall, was read by Mr. W. H. Wilkinson. It enumerated 51 species, and contained several new and many rare forms. A slide was exhibited, under the microscope, containing 50 of the species, which were mounted and presented to the society by Mr. Burgess. The report will appear in the "Midland Naturalist."—BIOLOGICAL SECTION. May 13th. Mr. J. E. Bagnall, A.L.S., gave an interesting paper on "The Flora of Sutton Park," which he illustrated by a number of dried specimens from Sutton Park, of which identical species have been found in the Cromer Forest beds.—GEOLOGICAL SECTION. May 20th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. W. R. Hughes exhibited, on behalf of the Rev. Gideon Livett, M.A., of Rochester, (1) a nodule from the Folkestone sand-beds; also, on behalf of Mr. John Amphlett, F.G.S., (2) two photographs of Llandovery sandstone with Favosites, Strophomena and Lindstromia. Mr. Charles Pumphrey exhibited a collection of Alpine plants from Switzerland, now in blossom in his garden, including the beautiful Alpine anemone and the wood lily, and many others. Mr. C. J. Watson exhibited photographs of fungi. Mr. T. H. Waller exhibited and described a large model microscope, specially adapted for petrological work, and also, by the courtesy of Messrs. J. Swift and Son, the makers, their new model microscope for the same purposes. This has been specially devised by some of the members of the Geological Survey, and all the arrangements are directed to facilitating the use of polarised light in the determination of minerals. The two Nichol's prisms are separately movable, but can also be rotated together by a system of gearing which also rotates the cross wires in the eye piece. This does away with the centreing of the stage for each objective, which is such a troublesome and often unsatisfactory operation. It also removes the necessity for a large stage, thereby much reducing the size of the instrument. When convergent polarised light is to be used the necessary high-angled condensing lens is simply slid into place in a slot in the stage, without any other disarrangement of parts, and when the suitable focussing lens is placed in position by a sliding piece in the body tube, the system of interference rings round the optic axis of crystals is very beautifully shown, even in the case of crystals whose optic axes are widely separated, that is, up to about 75° in air. For examining sections of rocks or small fragments of minerals, in convergent light, a much smaller focussing lens is provided, also sliding in a light fitting in the body tube near the field lens of the eye piece, and by this means the optical characters of very minute crystals may be successfully determined. The analyser is placed over the eye piece, and is attached to a hinge joint, which allows it to be very readily turned out of position and replaced. The microscope is of the size and general type of the "Students' Petrological Microscope," but the special novelties in the fittings render working with it very rapid and convenient.—SOCIOLOGICAL SECTION. Thirteen meetings of this Section have been held during the current year, the President, Mr. W. R. Hughes, F.L.S., in the chair, of which four were ordinary and nine supplementary. At the latter, the first part of Mr. Herbert Spencer's "Principles of Sociology" has been read, discussed, and expounded, the chapters being taken in the following order:—Jan. 23rd, Miss Goyne, chapter

ix., "The Ideas of the Animate and Inanimate." Feb. 13th, Miss Birt Davies, chapters x. and xi., "The Ideas of Sleep and Dreams," and "The Ideas of Swoon, Apoplexy, Catalepsy, Ecstasy, and other forms of Insensibility." Feb. 27th, Mr. Harold Buncher, chapters xii. and xiii., "The Ideas of Death and Resurrection," and "The Ideas of Souls, Ghosts, Spirits, Demons, &c." March 20th, Miss Byett, chapters xiv. and xv., "The Ideas of Another Life," and "The Ideas of Another World." March 27th, Mr. W. R. Hughes, F.L.S., President of the Section," chapters xvi., xvii., and xviii., "The Ideas of Supernatural Agents," "Supernatural Agents as Causing Epilepsy and Convulsive Actions, Delirium and Insanity, Disease and Death," and "Inspiration, Divination, Exorcism, and Sorcery." April 17th, Mr. E. Hill, chapter xix., "Sacred Places, Temples and Altars; Sacrifice, Fasting, and Propitiation; Praise, Prayer, &c." April 24th, Mr. J. A. Hill, F.R.C.S., chapters xx. and xxi., "Ancestor-worship in general," and "Idol-worship and Fetich-worship." May 8th, Mr. W. B. Grove, M.A., Vice-President of the Society, chapters xxii. and xxiii., "Animal-worship" and "Plant-worship." At this meeting an interesting correspondence with Mr. Herbert Spencer was read, and ordered to be entered on the minutes of the proceedings of the Section.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—March 31st. Mr. J. Madison exhibited specimens of *Dreissena polymorpha*, from the Oxford Canal near Brinklow, peculiar from having a white band along one valve; Mr. J. Collins, *Marchantia polymorpha*, showing sexual fructification; Mr. G. H. Corbett, specimens of *Ptirinea retroflexa* and *Theca antiqua*, from the Dudley district; Mr. Linton, cases of land, freshwater, and marine shells, British and foreign. Under the microscope, Mr. H. Hawkes showed *Jungermannia pusilla*, and Mr. Camm a series of fungi, including *Badhamia utricularis* and *B. macrocarpa*.—April 14th. Mr. J. W. Neville showed a number of leaf impressions from the Bournemouth beds; Mr. H. Hawkes, a collection of marine algæ, from Swanage; Mr. S. White, land, freshwater, and marine shells, from Swanage; Mr. C. P. Neville, a collection of foreign ferns; Mr. J. Madison, fossils from the Barton beds, including specimens of Pholas, taken out of lignite, and a series of shells of *Neritina fluviatilis*, including the yellow and black varieties. Mr. G. H. Corbett called attention to the confusion in the beds at Barton Cliff, caused by landslips, and showed a large series of fossils of that district; Mr. J. Collins showed a collection of algæ and lichens; Mr. Round, fossil ferns from the coal measures, Oldbury.—April 21st. Mr. J. W. Neville showed a series of lantern pictures illustrative of insect life. Of the thirteen orders into which insects were divided eight were said to be generally accepted, a few occupied debatable ground, and the others were so small as to be only known to specialists. The pictures illustrated generally the different orders, and in many instances gave the life-history of the insect. Some of the pictures were drawn from dissections, and showed the minute structure as it appeared under the microscope.—April 28th. Mr. J. Madison exhibited fossil shells from Barton Cliff, and recent shells collected near Christchurch; Mr. Deakin, a trilobite and other fossils from Great Barr; also specimens of *Helix ericetorum* from near Walsall; Mr. G. H. Corbett, specimens of iron pyrites, marcasite, and arragonite, from various localities; Mr. Linton, birds' nests and fir cones coated with lime, from the petrifying wells, Matlock. Under the microscope, Mr. H. Hawkes showed a section through the spore-head of *Equisetum*

arvense. A paper was then read by Mr. S. White, "Notes on Coalbrookdale and district." The scenery of the Severn Valley had been called lovely, but the writer's experience was that that expression would apply to the whole of Shropshire. The hills were spoken of as of peculiar interest, and the county abounded with historic spots. Coalbrookdale was famous for a great ironworks that is said to have cast the first three-legged pot and made the first iron bridge. From this starting point a series of rambles was made to Benthall Edge, Buildwas Abbey, Much Wenlock, Willy Hall, and Apley Park, the fossils, plants, shells, and birds being mentioned that were seen on the way. The writer said the Severn Valley was a naturalist's paradise, and as the river rolled on as it had done for untold ages, we thought of the wonderful story it could tell if it had articulate speech. —May 5th. Several members placed on the tables collections of fossils made during a ramble from Bescot to Pouk Hill, on the previous Saturday; they comprised ferns, fish scales, and the usual coal-measure fossils. Mr. Deakin showed specimens of *Balea perversa* and other shells, from the Isle of Wight; Mr. J. W. Neville, fossil ferns from Coleford Mine; Mr. Hawkes, Æcidio-spores of *Uromyces poæ*, on leaves of the lesser celandine, also eggs and young of *Tetranychus telarius*; Mr. Linton, butterflies from Zanzibar and Burmah.—May 12th. A paper was read by Mr. Round on "The Geological History of Oldbury." The writer said the more striking features of the district were three elevated ridges, the Castle Hill, Rowley Hill, and Warley Hill, and they were all different in formation. After describing the manner in which the sandstones, shales, and limestones of the district were laid down, the writer dealt with the different seams of coal, and the manner in which they were faulted. When 200 feet of beds had been deposited on the coal, an eruption took place covering a considerable area with lava, and forming the Rowley Hills. The changes that have taken place since that period were enumerated, and the evidence of the sea having washed the base of the Rowley Hills enlarged upon. The paper was illustrated by diagrams.

OXFORD NATURAL HISTORY SOCIETY.—April 29. Mr. H. M. J. Underhill gave a lecture on "Japanese Pictorial Art," profusely illustrated by lantern slides prepared by himself, mainly from original sources. After dealing with the rise and progress of the various schools, sacred and secular, and exhibiting typical illustrations, the lecturer exhibited a series of copies of native illustrations of the sacred mountain of Fujisan, under varying conditions of season and weather; and concluded with a set of pictures setting forth the adventures of Urashima, the fisher-lad (the Japanese Rip van Winkle), and native illustrations of an amusing fairy tale, "The Tongue-cut Sparrow."—May 13.—The Society welcomed the President (Mr. E. B. Poulton) on his return after a three months' absence. Mr. Kent delivered a lecture, illustrated by lantern slides, on the Manchester Ship Canal. The geological features of the district laid bare by the excavations were shown and described, beginning with the Triassic Red Sandstone and Marls, these latter being immediately capped by the Glacial Boulder Drift (leaving a long geological series unrepresented), and the whole topped by alternating layers of silt, gravels, and waterworn stones of the River Drift series. Several photographs were shown of the ancient "dug-out" discovered below the surface during the excavations, and now preserved in the Owens College Museum. The progress of the excavation and the machinery employed was illustrated and explained, and the daily life of the navvy at his work and his play.

A FIELD-NATURALIST'S NOTES IN NORTH DEVON.

BY O. V. APLIN,
MEMBER OF THE BRITISH ORNITHOLOGISTS' UNION.

In reviewing the following rough notes jotted down during a short visit to North Devon a few years ago, I cannot avoid the reflection that they contain far too much about the natural beauties of the district and too little concerning practical natural history. But that it should be so seemed unavoidable, for several reasons. There were difficulties to contend with in making careful observations, and it seemed impossible for an outdoor naturalist to visit this fascinating district for the first time without having most of his attention absorbed by Nature on her grander and larger scale. And, perhaps, it may be fairly argued that the study of natural scenery—of Nature's broadest effects—is, after all, the pursuit of field natural history in its widest, in its highest sense.

The subject matter of the geologist will be the foundation of most of such scenes; and after hours spent in poring over the work of his hammer, and in the search after minute fossil remains, the geologist will not be less of a naturalist if he turns to refresh his energies by letting his tired eyes wander in admiration over the rounded beauties of a chalk down, or by scanning the broken line of those rugged cliffs, the while he marks the effects on the natural scenery produced by the disintegrating forces of rain, and sun, and storm, to which the rock is slowly yielding. Linnæus, we are told, on seeing, for the first time in England a mass of golden whin in full bloom, fell on his knees at the brilliant appearance. And may not the humble wayside botanist experience a thrill of pleasure at the purple glories of a stretch of heather, the green shadings of a wooded hill-side, or the varied floral display with which the broken cliff is gay? Zoology contributes birds and butterflies to give beautiful life to the picture, and we borrow from meteorology all those ever-changing effects of sunshine, and sky, and cloud, which, transient as they are, leave often such a lasting impression on the mind of the observer.

A first visit, moreover, to a well known and favourite touring ground, in the height of the tourists' season, is not the best time for making notes. One's time is taken up with sight-seeing; and the constant stream of one's fellow tourists has generally a disastrous effect not only on the ferns but the local flora generally. It has also a tendency to drive the

birds to seek more secluded haunts. I found the best plan was to walk as much as possible between the places of interest, and in this way a good deal may be seen of natural history.

However, when I went on board the ex-mail steamer, "Gael," which lay some way off the pier-head at Portishead, on a rather dull, hot afternoon in August, I did not particularly expect to see much of my favourite birds during the week or two I was to spend in Devon.

Remarkably few birds were seen during a protracted run down the Bristol Channel to Ilfracombe against the flowing tide. Some Kittiwake and Herring, with a few Lesser Black-backed Gulls, and a little flock of Starlings, which rose from a rocky islet as we skirted the warm Glamorgan coast, were all I saw. But, for the absence of bird life, we were amply compensated by the beauty of the changing scenery.

In the afternoon of the day after I arrived, I wandered towards Hele over the high ground, known as Hillsborough, rising nearly 450 feet above the sea, and, like the next cliff, Rillage, running out into the sea in a long mole of pointed rock, round which the white foam is ever hissing. The upper part of the cliff at Rillage is broken and sloping. Descending this, I found a bright enough floral display. Heather and Hawkweeds, Ragworts, Harebells, Wood Sage, and the tall Hemp Agrimony—a perfect medley of rich, late summer colours. And over the flowers countless butterflies were flitting and dancing—Blues and Coppers, Meadow Browns, and Gatekeepers, and the rarer Graylings. Here, too, I gathered the Perfoliate Yellow-wort (*Chlora perfoliata*). Linnets twittered as they flew from bush to bush, a Wheatear takes a quick run and now stands motionless, save for an occasional flirt of his tail, on yonder turfy buttress; and the *sneek sneek* of the Rock Pipits draws attention to their dusky forms. Their specific name, *obscurus*, is very descriptive of their dusky plumage, but *maritimus* would describe their habits. I have never explored a rocky shore in summer, or a muddy one in winter, without meeting with these sea-side birds, and I have never seen them inland. Nor, indeed, have I ever come across a reliable record of their occurrence far away from the coast or a tidal river. A considerable colony of House Martins frequented the face of the overhanging grey shale cliff below me, and apparently were breeding, but, being awkwardly placed, I was unable to mark one to its nest.

A brilliant morning had been followed at noon by evident signs of a change in the weather. The atmosphere seemed

to thicken out at sea, obscuring the horizon where sea met sky in a confused mass of lurid cloud. Moreover, the warning storm cone was hoisted. So I was not altogether surprised to find, on ascending the cliff again, that the change had come. The wind had freshened and was blowing half a gale from E.S.E., with scuds of driving rain flying along from the high ground inland. What a contrast this wind-swept grassy down presented! I had left behind the flowery cliff, the Martins, and the butterflies, and now one or two Linnets or a Wheatear, flying to more sheltered quarters, were the only sign of life; and the flora was made up of patches of delicately coloured pink Thrift, stunted Heather, and the Carline Thistle, whose hygrometric petals had curled up against the rain. In the bed of a disused stone pit, affording a little shelter, tall plants of the Foxglove and Great Woolly Mullein flourished.

The number of ordinary sea birds which one meets with here at this season is rather disappointing, when we consider the near proximity of that great bird nursery, Lundy Island, as well as the lesser one at Baggy Point. Most of the birds should have left their breeding cliffs by mid-August to spread along the coast; but the Guillemots, Puffins, and Razorbills would be out in the tideway, and the fine weather draws the Gulls out to sea. I only saw one example of the Gannet, which has its only English breeding colony on Lundy; this was a fine adult bird, which appeared off Ilfracombe on the 15th. An old Gannet fishing in his own peculiar fashion is a fine sight. Smoothly, gently, and evenly he sails along on his long, narrow pinions; at a little distance his plumage is snowy white, save for the black wing-tips, which only add to the beauty of the contrast with the dancing blue of a sunlit bay. Now he pauses in his flight, turning on his side as he swings round on the breeze; then the great wings close, and down he comes, almost perpendicularly, with a splash on to the water. Almost submerged for a few seconds, the spray alone would hide the fisher from our view, and when next we see *Sula* he is floating on the surface. The fish comfortably pouched, he turns head to wind, and, rising heavily, flaps a little way just over the waves before attaining his former elevation. The little Kittiwake is the most noticeable Gull here. A few individuals always affectionately haunted the spot where the town sewage entered the sea, and they often came right into the harbour basin, their delicate grey and white tints contrasting with the deep green background of shrubs and trees, as well as with the sombre hues of the numerous Jackdaws frequenting the wooded slope.

The Lesser Black-backed and Herring Gulls were often to be seen, singly and two or three together; all three species breed on Lundy and at Baggy Point. But the only occasion on which I ever saw any large concourse of Gulls was one morning when we were steaming to Clovelly in the "Velindra." Quite a large flock, comprising all three species, were busily feeding on a shoal of fish some way off Baggy Point. Loud was the screaming, the *giks*, the *yanks*, and *wa-ows*, as they swooped down greedily on their slippery prey. I only noticed a single Guillemot, in summer dress, when crossing Bideford Bay; hundreds breed at Lundy and Baggy, but no doubt by that time they were all out in the tideway. We had passed out of the rough water encountered where the Morte Stone lies exposed to the long Atlantic swell, and where the white horses were rearing their crests in all directions, and now were in the smooth water of the bay. The long range of Braunton Burrows lay on our port side, with its yellow sand-hills shining in the sun (now tardily breaking through the mist), stretching on to the estuary of the Taw and Torridge; and on ahead loomed the distant island of Lundy, looking like a purple cloud bank resting on the waves. As we steamed on and neared the great green wall of wood-clothed cliff, which rises almost at once from the narrow boulder beach at Clovelly, and marked the white houses, scattered step-like up the steep, come gradually into sight, a Cormorant crossed our bows, flapping lazily out to sea, But Cormorants seem scarce on this coast. I only saw two more, one at Ilfracombe, and the third we looked down upon from the north walk leading from Lynton to the Valley of Rocks, as it flapped heavily along at the foot of the cliffs hundreds of feet below us. That beautiful walk! Sweet, fresh air all around, fragrant with the delicate blended scent of heather, dwarf gorse, and wood sage; on the one hand, sloping upwards, the flowery cliff; on the other, the bright blue sea—so far down that our ears can only catch a faint murmur of the tide as it beats and dashes against the rocks. Lynton, in its unrailwayed freshness, will live in the minds of many, and its name will call up memories of bright days long since dulled over, but never to be obliterated. As we stand in the garden at the back of the Castle Hotel this cloudless August day, and look northwards, there is spread out before us a panorama, so varied, so extensive, so full of light and colour, that we may well wonder at the wealth of beauty in nature. On our left, rising still higher, the barren, dusky heights towards the Valley of Rocks. In front, 500 feet below, through the wooded slope, almost tropical in its luxuriousness, lies Lynmouth with its picturesque scattered

villas and houses and quaint warm-coloured tower at the end of the fishing jetty. Round the curve of the coast, eastward, the great headlands of red sandstone rise one after the other to terminate in the bold cliff of the Foreland. To the south-east the valley of the East Lynn can be traced as it runs inland, its slopes on either side thickly covered with dense oak scrub, the deep green sharply contrasting with the glowing purple heather which caps the higher summits; while out to the north the brightest blue sea is studded with many a sail or dark steamer, dwarfed down to toy boats in the distance, and stretches away only to be bounded by a hazy purple out-line marking the Cambrian coast.

There were two birds of which I hoped to see something here, along the rushing, boulder-strewn River Lynn. The Grey Wagtail comes to us in the southern midlands for the winter, but rarely stays to breed, preferring always the rapid streams of the north and west. In Devon I expected to see a little of him in his summer haunts. The Dipper is even a greater lover still of the rush and swirl and ripple and dash of the mountain watercourse. Of it I knew but little, having previously only met with it in North Wales. As you pass down the main street of Lynmouth, leading to the beach, you cross the bridge over the East Lynn a little way above the river mouth. Just above the bridge the river is full of huge iron-grey boulders, through which the river flows with a delightful musical murmur. As far as contrast goes, you could not have a better background to show up the clear light grey and sulphur-yellow tints of the Grey Wagtail than these dark grey boulders; and flitting about them, in a short piece of river, were no less than a dozen birds. Two broods, at least, and perhaps all birds of the year, for not one bore the distinctive black throat assumed by the adults in spring and summer. The crowd of tourists, and the trout-fishers casting their flies over the pools of clear brown water, had driven the Dippers away, and all up the river from the sea to where the Badgworthy water comes down to join the Lynn at Waters-meet I did not see one. There I left the beaten track, and wandered a little way up the tributary stream, pushing my way through the underwood. A little way up stream some flat-topped boulders, nearly flush with the water, stemmed the current in a little rapid, and flitting and jerking from one to the other, wading fearlessly through the shallows, or anon perched sedately on some higher stone, was the object of my search, the "Water-piet," with its neat blackish-brown dress beautifully relieved by the snowy white of its throat and breast. Walking back along the road above the river, the

sharp *zit zit* of another Dipper caught my ear as he sped along on rapid Kingfisher-like flight. The hanging oak woods were very quiet, and devoid of bird music, for it was the silent moulting season, and the Green Woodpecker and Marsh Titmouse are the only birds seen which I find entered in my note book.

A right glorious drive it is for the naturalist from Ilfracombe to Lynton by coach. The new road, which keeps along the coast as far as Watermouth, affords fine sea views; but more interesting, though less convenient, is the old coach road, into which we strike at Combe Martin. Here, where our first halt is made, the children bring specimens of the pretty silver-lead-ore from the mines, worked three hundred years ago. The deep, narrow road along which we pass is bordered with high fern-clothed banks, topped with rampant, straggling hedges, whose hazel boughs in places brush our faces even on the coach top. The scarlet berries of the rowans, conspicuous where the trees overhang the edges of the wooded and ivy-clad cliff at Watermouth, still brighten the hedges, and a noticeable feature is the thick masses of tall Hemp Agrimony (*Eupatorium cannabinum*), with dull purplish flowers. A terrifically deep descent brings us down to Parracombe, where we pull up at the "Fox and Goose," close to which runs the clearest and brightest of trout streams. Then a long pull up the two-mile hill and we come out on a new scene, into fresh light air. Parracombe Common, in all its August glories, of which who can tell! Who can convey any notion of the effect produced by *Ulex nanus* and *Erica cinerea*, the dwarf gorse and heather, purple and gold, purple and gold, stretching for miles and miles? A few sheep are feeding on the rather scanty provender. Little horned fellows, different enough from the large heavy West Devon sheep, for we are on the hitherto unenclosed borders of Exmoor Forest now, and these are Exmoor sheep. A pair of croaking Carrion Crows flap away as we approach; they have, no doubt, sometimes in winter an opportunity of tasting their nominal food after one of those great snowstorms of which Jan Ridd tells us so graphically. Far off on the southern horizon, blue in the distance, we catch sight of the granite peaks of Dartmoor, forty miles away. A few more miles and we are skirting the valley of the West Lynn, to the beauties of which it would be hard to do justice. Its precipitous sides, clothed with wood, in which the natural oak scrub is fast giving way to the more profitable larch plantations; and at the bottom, now through a narrow belt of meadow, now through and half hidden by the woods themselves, ripples and babbles, splashes and foams, the silver river.

The rather local Wood Wren was not uncommon in two or three localities, and still uttered its sibilant song, shorn of its latter part to some extent. Especially in the oak woods at Clovelly I noticed it was tolerably abundant. Its congener, the Chiffchaff, was also still in song. The Willow Wren, too, generally the most abundant of the three, but which is said to be less numerous in some parts of West Britain, I find entered in my notes as common. Several times in deep elm-shaded lanes I heard what I had no doubt was the song of the Cirl Bunting (*E. cirlus*), and subsequent experience of the bird elsewhere has confirmed this conviction. But so closely, at this time of year at all events, does the Cirl Bunting, skulk in the leafy tree tops that I was never able to obtain a clear sight of one of the singers, and a hen bird identified at Berrynarbor was the only example of this species which I saw in North Devon. Walking into Bideford from Clovelly one day I noticed many Kestrels, and was pleased to come across some Goldfinches at Ford and Fairy Cross.

Kittiwakes were flying up the Torridge at Bideford (apparently following the flowing tide) as I stood at the hotel window after dinner, watching the salmon nets being paid out, and listening to the swirl and ripple of the tide as it flowed under the old, many-arched bridge, and gradually covered the gleaming yellow sands. The furzy cliff tops were often enlivened by the sprightly Stonechats, with their young broods out on the fern and bramble covered banks, as well as by their more terrestrial cousins, the Wheatears.

(*To be continued.*)

THE ORIGIN OF DECORATIVE ART AS ILLUSTRATED BY THE ART OF MODERN SAVAGES.

BY HENRY BALFOUR, M.A., F.Z.S.

(*Concluded from page 136.*)

As in the case of the "boomerang" before mentioned, the next step, viz., the application of artificial means in order to increase the resemblance, followed quickly upon the first appreciation of it. The addition, for example, of an eye to an object whose form already accidentally resembled an animal's head, or a few touches added to such projecting portions as resembled legs, are simple and obvious improvements. The carrying a little farther of the use of such means to increase an accidental resemblance would in time have suggested that

the whole animal might be represented by carving, and that, therefore, any substance which was easy to work could be fashioned into the desired shape. In this manner we can see how the art of carving models of animals and men and other objects probably grew up by easy stages from the very simplest beginnings.

We see traces of this piece of history in the every-day life of savages. Savages are devout Nature-worshippers, and any real or fancied resemblance to some favourite object in nature is readily appreciated and made use of; it even bids fair to raise the object whose form suggests the resemblance to the dignity of a fetich.

Most savages are in the habit of making realistic or would-be realistic models of animals and men in a variety of substances, of which wood and clay are the chief. The former, no doubt, more often offers accidental resemblances to objects in nature, while the latter, owing to its plastic nature, is readily moulded into any shape, and lends itself to the purpose.

However rude these representations may be, the intention is realistic and the greater or less resemblance to nature is only a question of skill. But want of skill may of itself tend to alter the character of such designs. Imperfect realism readily degenerates into the "grotesque," and this may partly account for the great prevalence of fanciful representation of objects among so many savage peoples. The study of the grotesque is reduced to a science among many races, the Maoris of New Zealand and the natives of New Guinea, for example. Another reason for the great affinity for the grotesque is that under this form more or less symbolic designs may be made use of with highly decorative effect.

But realistic art in carving may tend to become fanciful or conventional in other ways, and for other reasons. When once the idea of carving representations of natural objects had been arrived at and become rooted, any object whose form was suitable for shaping into a model would be liable to be so used. The handle of a tool or weapon might offer a surface to which the carving of some animal or part of an animal might be applied. This is a step towards conventional representation. It is not necessary that the artist should intend to decorate the implement. In this case the primary idea is to create a portrait; the secondary result is the embellishment of the handle, though the design is not modified to serve as ornament. We constantly see the extremities of the ivory implements of the Esquimaux carved into realistic representations of animals' heads, which are as true to nature

as the skill of these people allows. This form of realistic decorative carving leads on to fanciful carving from the force of circumstances, by the sometimes necessary *distortion* of natural form or attitude, for the purpose of adapting the design to the object to be ornamented, which may not lend itself readily to a faithful life study. Take the Esquimaux implements again. On many of these are carved representations of entire animals, and frequently we see that while the head, perhaps, may be faithfully rendered, yet the body, owing to want of space, has had to be cramped up and distorted into an impossible attitude, which spoils the faithfulness of the model. In the first stage the design is made as realistic as possible under the circumstances, but from this necessary distortion, suggesting of itself a fanciful or grotesque design, often the original design has been reduced to a meaningless decoration, in which the idea of a real object is lost, though the ornamental effect may very probably be increased.

In connection with solid carving, I may give one more example of the manner in which a design has suggested itself. Among the various weapons of savages we frequently see clubs for the making of which small trees have been uprooted. The stem is rounded to form a handle, while the root end is trimmed to form the head or "business end," which is rendered the more formidable by leaving the stumps of the roots projecting as points or knobs. It being found that such a club was the more effective when applied to an enemy's head for having the root stumps remaining, other clubs not similarly provided with natural projections have been furnished with them artificially, by carving upon the heads projecting points in imitation of the root stumps. In the more carefully made clubs we find these knobs disposed far more regularly than would have been the case with natural root stumps; but they nevertheless show clearly that they were suggested by the latter, of which they are somewhat conventional imitations. Here then a design suggested by Nature has been perpetuated because of its obvious utility, though it is at the same time utilised to enhance the ornamental effect of the weapon.

Let me now turn to consider the application of the art of design to flat surfaces, as opposed to sculpture or modelling in the round. It is very possible that the idea of representing objects in nature by means of lines upon a flat surface, was in the first instance suggested by the supplementary lines added to figures carved in complete relief, in order to express certain details which would not otherwise appear in the process of giving the shape. The use of such lines to

express certain of the less prominent features is extremely common, and the greater the use of this form of giving expression, the less the need of representation in the solid or bold relief. This may have by degrees suggested that the entire object might by means of lines be represented upon a flat surface. Be this as it may, nearly all savage races down to the lowest, are accustomed to draw outline or filled-in figures of men and animals upon such surfaces as bark of trees, stones, and walls of caves. The designs are for the most part rude, and partake of the necessary character of the decorated surface, viz. flatness, as light and shade have not entered into the pictorial art of the lower savage races.

The use of colour is extremely ancient, and of its origin we have no record. Already, in the French caves of the Palæolithic period, the use of colour is evidenced by the discovery of shells full of red hæmatite, or oxide of manganese, which has been ground to a powder. It is not known whether the colouring matters were then used for "painting pictures," or whether, as is very likely, they were used for daubing over the bodies of the inhabitants of the caves. This latter is a custom dating from remote antiquity, and one which is very prevalent in most savage races, existing, too, in a "refined form" even in the most civilised nations of the globe. No doubt, too, the use of pigments in the decorative arts is also of great antiquity. All savages, or nearly all, apply colour to this purpose; such colouring matters as red ochre, hæmatite, lime, charcoal, the juices of some plants, and others, are commonly used as paint by the lowest races, often mixed with grease or oil as a medium, and these must readily have suggested themselves for decorative use other than that of personal adornment.

I have already described a simple way in which a primitive form of decoration applied to a flat surface has suggested itself, when I mentioned the "boomerang" with the knots stained black to throw them into greater prominence. Many other instances might be given to show how a natural peculiarity, when slightly intensified, gives a decorative effect to a useful object. The joints or nodes of reeds and bamboos are by many savages scraped so as to represent bands at regular intervals. These may be also picked out in colours, or, in the hands of more laborious artists the scraped bands may give way to bands composed of finely incised lines; but it is clear that these forms of decoration have owed their origin to a desire to improve upon the natural decorative effect of the nodes.

Occasionally various objects used in the manufacture of different articles of use suggest a form of ornamentation, as

when in the manufacture of coarse forms of pottery, the plaited or twisted bindings (used in order to keep together the moist clay shape before baking) leave behind them, in the baked vessel, an imprint of their outline The regularity of the markings suggests a simple pattern, which in many cases has been adopted as such and perpetuated and improved upon by other means, after the use of the bands has died out. Gourd bottles from the Sandwich Islands frequently have traced upon them a pattern which was originally intended to represent the string work (employed for carrying the vessel), in those examples in which the use of the strings were dispensed with. Another instance is seen in the modern registered envelope with the blue lines printed across it, representing the string binding which formerly was used to secure the letters.

When one material is substituted for another, and the shape of some useful object becomes altered in consequence, very frequently the earlier form of the object is indicated by means of ornamental lines. Let me give an example. The Andamanese are in the habit of using the large *Pinna* shells as food dishes, each valve forming a plate or dish. These valves are pointed at one end and broad and rounded at the other. Wood has, however, been largely substituted for the shells for this purpose, and it has been found convenient to make both ends pointed, the points serving as convenient handles. Though the original shape is thus altered, in some examples of the double-pointed wooden platters a curved line is added in wax at one end, in this way indicating the rounded end of the natural shell. This form of perpetuation of a former idea under altered circumstances is highly characteristic of the savage; many instances too, of a like nature occur to one from our own civilised surroundings.

After the use of an object has died out it is often retained as ornament from force of habit. The buttons at the back of a man's coat in the present day are an instance in point. These no longer serve a useful purpose, but formerly they were used to fasten back the flaps of the coat, especially in riding. Something would seem to be wanting if they were done away with; the eye has been accustomed to seeing them there, and their absence would give an unfinished appearance; hence their retention. I have pointed out how designs drawn upon flat surfaces tend to degenerate into meaningless patterns in the course of successive copyings, either by conscious or unconscious variation from the original type. The value of serial arrangements in museums is especially made manifest by series which illustrate the succession of changes in patterns, thus tracing the history of particular designs.

The most complicated designs are frequently nothing more than a combination of simple ones, repeated over and over again in geometrical arrangements, The Fijian furnished with a simple wooden stamp, cut, say, in the form of a lozenge-shape or triangle, can print upon his bark cloth a number of diamonds or triangles, arranged in any order which can be varied at pleasure, and give rise to apparently complex geometrical patterns. Thus a combination of simple elements can produce elaborate results, even in the hands of the most uncultivated.

Would-be realistic pictures very frequently become fanciful or unrealistic because of the material used. This is especially noticeable in basket work, in which attempts at representing figures of animals, etc., fail to be at all realistic because of the impossibility of forming satisfactory curves. Woven designs often exhibit the same unavoidably strained designs.

Let me, in conclusion, briefly recall the main points of my paper.

The archæological evidence of the gradual growth of decorative art is very incomplete, and we, therefore, turn to modern savage life and study the condition of art among the lower races, in order that we may supply what is lacking in the archæological record. We have every reason to believe that the art of decoration was evolved in the first instance from a simple appreciation of striking natural peculiarities, accidentally brought under man's notice. This appreciation of natural peculiarities led to the desire to increase their effect by artificial means, and later to copy them where they did not exist. Copying gives rise to variations from an original design, and this in two ways: by *unconscious* variation, the result of want of skill in copying ; and by *conscious* variation, when it is the intention to vary the design. By means of successive copyings, a design may completely change its character, so that at a late stage it may have utterly lost all resemblance to the original idea.

General Pitt-Rivers was practically the first to point out the importance of the study of the evolution of ornament, by means of series arranged to show the sequence of ideas, and the gradual development of patterns by successive slight changes. This was an item in his vast scheme of the similar treatment of all the arts of mankind. The changes which we can see taking place in the art of the nineteenth century, and the processes by which the field tends always to increase, are but the reflection of what has gone before during countless ages. Art is not a thing of spontaneous origin, but of slow and gradual growth, ever changing, and tending to advance from the simple to the complex.

A TOUR THROUGH SPAIN:
WITH SPECIAL REFERENCE TO THE FLORA OF THE COUNTRY.*

BY MR. G. C. DRUCE, M.A., F.L.S.

The Flora of Spain is of remarkable richness and variety, and, according to Wilkomm and Lange's "Flora Hispanica," the number of species recorded in Spain is:—

Ferns and allies	...	66 species.	...	26 genera.
Gymnosperms	...	36 ,,	...	10 ,,
Angiosperms	...	840 ,,	...	200 ,,
Apetalæ	...	242 ,,	...	69 ,,
Gamopetalæ	...	1,749 ,,	...	341 ,,
Dialypetalæ	...	2,159 ,,	...	384 ,,
		5,092		1,030

The richness of the Flora is specially exemplified in the more showy orders, so that while the number of *Juncaceæ* is only 37, and of the *Cyperaceæ* only 108, there are 665 *Compositæ*, 240 *Labiatæ*, 499 *Leguminiferæ*, and 300 *Cruciferæ*. In the writer's recent tour through Spain, little botanising was done round Barcelona, but a pleasant time was enjoyed in the busy maritime city. The public gardens are extensive and well laid out. The climate is singularly dry for a seaport; rain falls on an average only sixty-seven days in the year. The country between the frontier was, in places, very beautiful from the vast orchards of peach and almond trees in bloom. The Cathedral is a very beautiful one, and its quiet courtyard, with the orange trees and fountains, affords a charming retreat.

Tarragona afforded some interesting plants, including *Hypecoum grandiflorum*, *Chamærops humilis*, *Glaucium phæniceum*, *Lavandula Stæchas*, *Paronychia argentea*, *Plantago Psyllium*, *Fumaria agraria*, *F. spicata*, *F. muralis*, *Asphodelus*, *Salvia sp.*, *Centaurea sp. var.*, etc., etc. The Cathedral is very handsome and the Cyclopean Roman walls and aqueduct well repay a visit.

Valencia, situated in a rich valley, is another interesting city. The Cathedral, occupying the site of a temple of Diana, was begun in 1262. The district round the city is called the Huerta, and on this irrigated soil are grown rice, peas, maize, monkey nuts, carrob beans, almonds, peaches, grapes, oranges, palms, figs, tomatoes, capsicums, etc., in great

* Read before the Birmingham Natural History and Microscopical Society, and the Oxfordshire Natural History Society.

quantities. Lucerne is cut fifteen times in the year. Valencia is a great centre of the saffron culture. *Hyoscyamus albus* grew on one of the five bridges over the river.

The journey from Valencia to Cordova took a considerable time, but the rail side was enlivened with great quantities of Boraginaceous plants, such as *Borago*, *Nonnea*, *Anchusas*, *Echiums*, and *Echinospermums*. The fields were pink with *Erodiums*, and on the ballast grew vast quantities of the *Adonis*. Cordova is a most interesting city, although sadly changed since its glory during the Moorish occupation, when it had 600 mosques, 200,000 houses, and stretched twelve miles. It was then the successful rival of Damascus and Bagdad. The Mosque is still very magnificent with its 1,000 pillars of marble, its fine old tower and splendid silver lamp. In the court are orange trees three hundred years old, which, with the feathery palms and dark cypresses, give the place an Oriental appearance. On the Roman bridge, crossing the Guadalquiver, grew *Chrysanthemum coronarium*, and by the river among the corn grew *Muscari comosum*, *Anagallis cærulea*. *Hernaria hirsuta*, and *Campanula Speculum*. *Cerinthe major* occurred by the roadside. Here in March one revelled in summer heat and sunshine. The lilac was rather over flower and the oranges a magnificent sight. Sweet lemons were brought on for dessert. The Patio of the hotel had splendid Heliotropes.

A long journey through interesting country, during which hoopoes, red-legged partridges, etc., were noticed, led to Seville, at which a most enjoyable time was spent in visiting the splendid and spacious Cathedral, 400 feet long and 263 feet broad; with its vast organ of 5,000 pipes, and its wonderful Moorish tower (the Giralda tower), 350 feet high, round which wheeled in continuous and beautiful flight the *Falco hirunduloides*. The Museo, with its splendid pictures by Murillo, was visited again and again, as was the Cathedral, where everything is on a gigantic scale. The Paschal candlestick is twenty-five feet high; the candle contains 2,500 pounds of wax; 18,000 litres of wine are annually used for sacramental purposes. It contains the tomb of the father of Columbus, and two splendid examples of Murillo, "The Guardian Angel" and "The Vision of San Augustin."

The palace of the Alcazar is very beautiful. In the court were bananas in the open air, with nearly ripe fruit. Many varieties of oranges are cultivated in the gardens, which also boast two magnificent Magnolias.

Pilate's house, the cigar factory, with its 4,000 women working under one roof; the pleasant drives through Los Delicios, and the bull fight, were other objects seen.

From Seville a journey was made to Granada, which again made a most interesting place to stay in, the view of the great mountain range of the Sierra Nevada, with its snowy summits, being especially beautiful. Under the shade of Wellington's elms grew violets, *Ficaria grandiflora*, *Allium neapolitanum*, *Adiantum Capillus Veneris*, etc. On the walls of the world-famed Alhambra occurred *Clypeola Jonthlaspi*, and *Cotyledon lutea.* By the golden sands of the Darro grew *Holosteum umbellatum.* A very rich gathering was made on the lower slopes of the Sierra, which included *Thlaspi perfoliatum*, *Echinaria capitata*, *Euphorbia retusa*, *Gagea Soleorolii.* The tanks of the Alhambra were bordered with Myrtle, and in them grew *Zannichellia* and *Chara vulgaris*, while the badge of the town, the pomegranate, also ornamented the courts. By the Xenil *Asperugo procumbens*, *Asperula arvensis*, etc., occurred with sugar canes and maize.

The Cathedral has a splendid chapel, with the tombs of Ferdinand and Isabella.

Cadiz was next visited. The railside on the way was fenced with aloes and prickly pear. By the sea, *Lagurus ovatus*, with purple spikes, was noticed. *Alopecurus utriculatus*, *Lamarckia aurea*, *Antirrhinum Orontium*, *Retama monosperma*, *Mesembryanthemum crystallinum*, *Calendula arvensis*, *Solanum sodomæum*, *Trifolium tomentosum*, *Medicago denticulata*, etc., etc., were also gathered. Here was experienced the only wet day of the five weeks' journey. From San Fernando (near which are extensive salt works) a drive of seventy miles was made to Algeciras, which for richness of vegetation and natural beauty it would be difficult to rival. The wayside was gay with a most varied flora. It included the brilliant *Hedysarum coronarium*, *Lupinus luteus*, *Anemone palmata*, *Iris hispanica*, *Scilla peruviana*, *Gladiolus segetum*, *Cistus* in great variety, *Scrophularia sambucifolia*, *S. scorodonia*, *Scirpus Holochænus var. romanus*, *Allium roseum*, *Stachys hirta*, *Phlomis purpurea*, *Quercus occidentalis*, *Abies Pinsapo*, *Lotus tetragonolobus*, and various species of *Coronilla*, *Vicia*, *Convolvulus*, *Fumaria*, *Genista*, *Cytisus*, and *Iberis*. *Psoralea bituminosa* and *Lathyrus ochrus* were also gathered. From Algeciras, Gibraltar was reached by walking round the bay, which again afforded a numerous collection, including *Orobanche ramosa*, *Smilax aspera*, *Armeria plantaginea*, *Aristolochea rotunda* and *glauca*, *Trichonema Columnæ*, *Urginea Scilla*, *Schœnus mucronatus*, *Ranunculus bullatus*, *Serapias Lingua*, *Asparagus acutifolius*, *Ornithogalum bæticum*, *Allium triquetrum*, *Mathiola tricuspidata*, *Juncus maritimus*, *Erodium malacoides*, *Lupinus albus*, *Ononis hispanica*, *Ornithopus compressus*, *Senecio gallicus*,

Bellis sylvestris, *Ecballium Elaterium*, *Oxalis cernua*, and many species of *Vicia*, *Lathyrus*, *Medicago*, *Scorpiurus*, *Coronilla*, *Genista*, *Cytisus*, *Ferula*, *Thapsus*, *Trifolium*, etc., etc.

Gibraltar yielded, considering the dryness of the rock, a large number of species, inclusive of *Lavandula dentata*, *Ophrys lutea*, *Stachys hirta*, *Cerastium gibraltaricum*, *Saxifraga gibraltarica*, *Mercurialis ambigua*, *Iberis gibraltarica*, *Phytolacca decandra*, *Ruscus Hypoglossum*, *Arisarum vulgare*, *Statice emarginata*, *Linaria tristis*, *Phagnalon saxatile*, *Fedia Cornucopiæ*, *Mesembryanthemum*, *Ecballium Elaterium*, *Teucrium lucidum*, *Stachys circinata*, etc., etc. The view from the rock summit was very fine, Ceuta and the African coast being plainly seen. So fascinating had proved the coast walk that it was again traversed, and so, too, was the seventy miles' drive to San Fernando, by Tarifa and Medina Sidonia. From San Fernando, Xeres (the great centre of the sherry district) was visited, and then Seville was revisited for the attractions of Holy Week, after which Madrid was made the next stopping place. Here the magnificent picture gallery—second to none in the world—proved a formidable rival to botany, especially as all the drying.paper had long ago been used up. The extensive Botanic Gardens were a desert, a cyclone destroyed them in a few minutes some years ago. Toledo, the seat of the Primate of Spain, proved an interesting town ; but the once celebrated Toledo steel is now but little manufactured, and the city has probably dwindled to a tenth of its former importance. By the Tagus, on which it stands, were gathered *Hutchinsia petræa*, *Holosteum umbellatum*, *Mibora minima*, *Thlaspi perfoliatum*, *Lamium maculatum*, etc. Burgos, the next resting-place, was rendered unpleasant by the biting cold, doubly felt after the almost tropical weather which had been previously experienced, but the pleasure of seeing the splendid Gothic Cathedral compensated for the weather. The district round is very sterile and ugly. San Sebastian, on the Bay of Biscay, was much enjoyed. The scenery of the north-western Pyrenees is grand and the climate pleasant. The flora around is rich and varied. The lower slopes of the mountains were blue with the lovely flowers of *Lithospermum prostratum*, or studded with *Potentilla alba*. Here and there were seen *Narcissus Bulbocodium*, the beautiful *Pinguicula grandiflora*, and *Pulmonaria*. *Smilax mauritanica*, *Helleborus viridis*, *Asplenium acutum*, *Erica mediterranea*, *Sibthorpia europæa*, *Primula elatior*, *Symphytum tuberosum*, *Scilla bifolia*, and *Corydalis* were also noticed. The writer was present there on the occasion of the visit of Her Majesty this year, when the town presented a remarkable sight.

It may be stated that although railway journeys in Spain are slow, yet the five minutes at each station gives an opportunity for picking up many plants which would otherwise be overlooked. The buffets on the Andalusian and Catalonian lines are fairly good and reasonable, but travellers from Seville northwards to Bayonne had better provide themselves with refreshments for their journey. For guide books, Murray's is certainly the best. For botany, the "Flora Hispanica," by Wilkomm and Lange, is a capital book. Kelaart's "Flora Calpensis" is useful, as is also Boissier's "Voyage d'Espagne." Colmeiro's "Enumeracion" gives a good idea of plant distribution through the Peninsula, and various isolated papers by Joseph Woods and Bentham are also recommended.

MISS CONSTANCE C. W. NADEN.

A book, in which the readers of the "Midland Naturalist" will feel much interest, has just been published by Messrs. Bickers and Son, London. Its title is, "Induction and Deduction: a historical and critical sketch of successive philosophical conceptions respecting the relations between Inductive and Deductive Thought, and other Essays," by Constance C. W. Naden; edited by R. Lewins, M.D., Army Medical Department. "Induction and Deduction" occupies the larger part of the volume. The other essays are: "Evolutionary Ethics," "The Philosophy of Thomas Carlyle," "The Brain Theory of Mind and Matter: or Hylo-Idealism," "Hylo-Idealism: The Creed of the Coming Day." "The Principles of Sociology," and "Animal Automatism: a Criticism of Dr. Huxley's Essays on Science and Culture." The volume also contains a short "Memoir" by Miss Naden's friend, Mrs. Daniell, and a short "Note" by Dr. Lewins, and has for a frontispiece an excellent portrait of Miss Naden, beautifully engraved, by G. J. Stodart.

Dr. Lewins forwarded an early copy of the book to Mr. Herbert Spencer, from whom he has received the following interesting letter:—

Fairfield, Pewsey, Wilts, 10th June, 1890.

Sir,—Before I received your letter of the 8th instant, I was about to write expressing my thanks for the copy you have kindly sent me of Miss Naden's "Induction and Deduction," and other Essays. Already I had formed a high estimate of her intellect and character, and now perusal of some parts of the volume you have sent me has greatly raised my estimate.

Very generally, receptivity and originality are not associated; but in her mind they appear to have been equally great. I can think of

no woman save George Eliot in whom there has been this union of high philosophical capacity with extensive acquisition Unquestionably her subtile intelligence would have done much in furtherance of rational thought; and her death has entailed a serious loss.

While I say this, however, I cannot let pass the occasion for remarking that in her case, as in other cases, the mental powers so highly developed in a woman are in some measure abnormal, and involve a physiological cost which her feminine organisation will not bear without injury more or less profound.

I am glad to hear that you propose to publish another series of her Essays, and am quite willing that you should, if you wish, include in it the foregoing expressions of my admiration.

I am, dear Sir, faithfully yours,

HERBERT SPENCER.

R. Lewins, Esq., M.D.

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(Continued from page 206, Vol. XII.)

The second edition of "A Descriptive History of the Town of Evesham," by George May, a printer and bookseller in that town, was published in 1845. It contains, pp. 419-25, a list of plants, of aquatic and land shells, and of fossils, bearing the collective title of "Gleanings in Natural History within the neighbourhood of Evesham," for which the author, p. 415, acknowledges his indebtedness "to the Rev. David Davis, late of Evesham; to Miss Strickland, late of Cracombe; to Mr. Herbert New of Evesham; to Mr. Gibbs of Offenham."

The catalogue of "Characteristic and Rare Plants in the Vicinity," which is attributed to Mr. Herbert New, contains 141 species. Many of these are interesting plants, but the catalogue affords no certain addition to the Flora of the county. The two following entries are worthy of notice :—

*† **Orobanche elatior.** Tall Broom Rape. Fields of clover about the villages of Moor and Wyre. *It is doubtful what is intended here. Orobanche elatior is parasitical upon Centaurea Scabiosa, Orobanche minor upon clover. The same doubt arises in the record of O. elatior given by Mr. Edwin Lees in his "Flora of the Malvern Hills." See "Mid. Nat.," Vol. XII., p. 183.*

*† **Thymus Nepeta** (*Calamintha Nepeta*). Lesser Calamint. Shrubbery, Fladbury Rectory. *A very doubtful record. See Lees, "Mid. Nat., Vol. XI., p. 279."*

The catalogue above mentioned is, so far as I have been able to ascertain, the last published list of Worcester plants

belonging to the first half of the present century. Before passing on to the second half of the century, it will be convenient to say a few words upon the first series of the "Phytologist." This well-known periodical was the property of the late Edward Newman. The first number appeared in June, 1841. The last volume, of 240 pages only, is that for the year, 1854, although the date upon the title page is 1856. Vol. I. and the first part of Vol. II., 1841 to 1846, were edited by Mr. George Luxford ; the remaining portion of the work by Mr. Newman himself. Among those of the contributors, who were either Worcester botanists or sent notices of Worcester plants, may be mentioned the names of the Rev. W. L. Baynon, Mr. Benjamin Maund, of Bromsgrove, Mr. Samuel Freeman, Mr. Edwin Lees, Mr. Ed. Newman, Mr. George Reece, and Mr. Thomas Westcombe.

Mr. Freeman's and Mr. Newman's contributions have already been noticed. (See "Midland Naturalist," Vol. XII., p. 67.) One or two other records must also be referred to.

In Vol. I., p. 46, under date July 12th, 1841, Mr. Lees records Allosorus crispus as growing on the Malvern Hills. This must take precedence of the notice in the first edition of the "Botany of the Malvern Hills," 1843.

Lepidium Draba. In Vol. I., p. 679. Mr. Lees, July 12th, 1843, records this plant as growing near the bridge over the Teme at Powick. *First county record.*

In Vol. I., page 715, under date August 6th, 1843, is a note by Mr. Samuel Gibson, "On an apparently undescribed British Carex." This is the plant referred to *Carex ovalis*, var. *bracteata*, in Mr. Lees's "Botany of the Malvern Hills," 1st edition, p. 48, foot note. Mr. Gibson gives it the provisional name of "*Carex Malvernensis.*"

In Vol. II., page 751, is a notice of a meeting of the Botanical Society of London, held on the 1st January, 1847, at which Mr. T. Westcombe exhibited specimens of this Carex, and doubtfully referred it to *Carex argyroclochin* of Hornemann. It does not agree with the figure of that form in Reich. "Icones," Vol. VIII., Tab. ccxi., and is now known as *Carex ovalis*, var. *bracteata*, see Syme, Eng. Bot., p. 104.

Œnanthe Lachenalii. Welland Marshes. Edwin Lees, 23rd Sept., 1845. Vol. II., p. 357. *First county record.*

Œ. Lachenalii. Defford Common. Dec., 1845. R. J. N. Streeten, M.D. Vol. II., p. 405. Dr. Streeten states that he gathered the plant in this locality in 1840, considering it, at that time, to be *Œnanthe pimpinelloides.*

Rubus Lindleianus. This species, first established by Mr. Edwin Lees, 2nd November, 1848, Vol. III., p. 361, is entered as Rubus nitidus in the "Bot. Mal. Hills," 1st edit., 1843.

In Vol. III., part 2, 1849, p. 546, is a notice of "The Ancient Straits of Malvern," by James Buckman, F.G.S., Professor of Geology and Botany in the Royal Agricultural College, Cirencester. There is no date to the notice, but from the dates of the neighbouring articles I conclude that it appeared in the June number. I am indebted to the late Professor Buckman for a copy of the essay, a thin octavo volume of thirty pages, published by Longmans. There is no date on the title page, nor at the foot of the preface, but, from the notice in the "Phytologist," the volume may be assigned to the first half of 1849.

It contains, pp. 13-5, a list of marine plants now growing in the valley of the Severn, among them those of the saline waters of the Droitwich Canal, the first notice of this peculiar feature of the Botany of Worcester. Eighteen species are enumerated by Professor Buckman; the list contains, *inter alia*, the following records:—

* **Lepidium ruderale.** Found on the banks of the Droitwich Canal in 1847. *The discoverers of the plant in this locality were Mr. Edwin Lees and Mr. Thomas Baxter, "Phytologist," Vol. III., p. 511. The first county record was by Dr. Stokes, 1787. "Rubbish on the side of the Severn above Worcester." It was growing in profusion in July, 1885, at the foot of the dam of the Tardebigg reservoir of the Worcester and Birmingham Canal, where it was pointed out to me by my friend Mr. John Humphreys, of Bromsgrove.*

* **Arenaria marina.** In various spots close to the edge of the saline Droitwich Canal. *A misnomer. The Droitwich Canal plant is the Lepigonum salinum of Kindberg; Spergularia neglecta, Syme, observed by Purton on Defford Common, 1817. See "Mid. Nat.," Vol. X., p. 221.*

* **Apium graveolens.** Abundant in ditches throughout the Vale of Severn, from Worcester to Cheltenham and Gloucester. Also fringing the Droitwich Canal most luxuriantly. *See Stokes, "Mid. Nat.," Vol. X., p. 152.*

Glaux maritima. In the greatest profusion on the side of the Droitwich Canal, between Bevereye and Salwarpe, above Worcester.

* **Samolus Valerandi.** *Defford Common. See Stokes, "Mid. Nat.," Vol. X., p. 154.*

*† **Plantago maritima.** Recorded in the "Phytologist" as having been found on Hartlebury Common by Mr. Reece of the Worcester Museum. *No reference to the volume and page of the "Phytologist" where the record occurs. I have failed to find the record and suspect an error. The plant is marked as extinct in Lees's "Botany of Worcestershire," 1867. See tabulated List of Plants, p. 23. See also Scott, "Mid. Nat.," Vol. XI., p. 20.*

Atriplex rosea. *(A. Babingtonii, Woods.)* Gathered on the banks of the Worcester Canal by Mr. T. Westcombe, of Worcester.

Poa (*Sclerochloa*) **distans.** Flourishing abundantly on the banks of the Droitwich Canal *See Scott. "Mid. Nat.," Vol. XI., p. 42.*

Triticum junceum. Also growing by the side of the Droitwich Canal. *Mr. Lees refers the Droitwich Canal Triticum to T. laxum, Fries. See "Botany of Worcestershire," p. 21. (Triticum acutum, DC.) See Scott, "Mid. Nat.," Vol. XI., p. 42.*

Professor Buckman refers the presence of the Droitwich Canal plants to two possible causes: "Either that the seeds were brought up by vessels trafficking on the Severn and Canal, or that they were derived from the seeds of plants which actually grew there when the marine conditions formerly prevailed, and that the partial restoration of the same circumstances in the canal caused them again to germinate." Professor Buckman adopts the latter alternative, the former appears to me at least equally probable.

Villarsia Nymphæoides. In the River Avon, between Pershore and Eckington, June, 1850. Mr. George Reece, Curator of the Worcester Museum. Vol. IV., p. 5. *First county record.*

A paper on the Rubi, by Mr. Edwin Lees, dated March 9th, 1853, Vol. IV., p. 917, must stand over for future notice.

Another periodical belonging to this epoch is the "Botanical Gazette." It was edited by Arthur Henfrey, and existed only three years, 1849 to 1851. Many of the best known botanists of the time were among the contributors, but it contains, so far as I know, no new Worcester records.

(To be continued.)

Wayside Notes.

CYSTIC CONDITION OF THE GONADS IN HELIX ASPERSA.—Last year, (June 25th), when dissecting a *Helix aspersa*, I found the neck of the spermatheca dilated into a cyst (¼in. diam.), and the longer portion of the same duct also dilated, but not so much as the neck. The other diverticulum was dilated for ⅜in. (long meas.) two inches from its commencement, and again half an inch higher up still from this dilation another occurred, about ⅛in. in long meas. These little pathological conditions are interesting, and it is a wonder that conchologists have as yet paid hardly any attention to the subject.—J. W. WILLIAMS, 57, Corinne Road, Tufnell Park, London, N.

HELIX RUFESCENS monst. SUBSCALARE (monst. nov.)—Mr. A. Mayfield, of Norwich, has lately sent me an interesting subscalariform monstrosity of *Helix rufescens* (Penn.), which presents several peculiarities, and which, so long as variety naming exists, I purpose calling monst. *subscalare.* The shell is large, brownish, with a white band at the periphery (so far corresponding to Cockerell's var. *albocincta*, vide "Naturalist's World," 1886, p. 179); spire elevated, with its whorls subcarinated and flattened; body-whorl smaller than in type, depressed, subcarinated; suture canaliculate; umbilicus wider, revealing the whorls of the spire; inner lip distinct and reflected on to the body-whorl, forming a well-marked "parietal wall;" the whole shell subscalariform; diam., 11·5 mill.; alt., 8 mill.; locality, Eaton, Norwich. —J. W. WILLIAMS, Mitton, Stourport.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—BIOLOGICAL SECTION. June 10th. Mr. W. R. Hughes in the chair. Mr. J. W. Gray, C.E., was proposed for membership. Mr. W. H. Wilkinson exhibited several lichens collected on the Broadway excursion, viz.:—*Parmelia olivacea*, *P. saxatilis*, *Physcia pulverulenta*, *P. ciliaris*, *Cladonia pyxidata*, *Placodium murorum*, and *Lecanora subfusca*. Mr. W. R. Hughes exhibited, also from Broadway, *Polygala vulgaris*, showing various shades of colour from white, pink, pale blue, dark blue, to purple; also *Listera ovata*, *Orchis maculata*, and *Briza media*. Mr. E. H. Wagstaff exhibited part of bottom of ship's timber pierced by the Teredo worm, from Weymouth Bay. Mr. Colbran J. Wainwright exhibited *Notodonta camelina* and *Ptilodontis palpina*, in state of rest, resembling dead leaves, &c.; *Volucella bombylans*, mimicking *Bombus lapidarius* and *muscorum*, in whose nests its eggs are laid, and whose larvæ are the prey of the larvæ of Volucella.—GEOLOGICAL SECTION. June 17th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Mr. J. W. Gray, C.E., of Bristol Road, was unanimously elected a member. Mr. Hughes exhibited specimens of Diorite, *Lithostrotion basaltiforme*, and Rhyolite, from the Wrekin. Mr. Waller exhibited a section of glassy rock with perlitic cracks, also with spherulites through which the streams of microliths pass uninterruptedly. Mr. J. Edmonds exhibited a pebble of carboniferous sandstone with calamites. Dr. Chas. Callaway, F.G.S., read his paper on the "Unconformity between the Uriconian and Cambrian Rocks of Shropshire." A hearty vote of thanks to Dr. Callaway was proposed by the Chairman, seconded by Professor Lapworth, and carried unanimously.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—May 19th. Mr. Wagstaff exhibited a part of a ship's bottom filled with perforations of *Teredo navalis*, also a polished specimen of Brazilian agate; Mr. J. Madison, a case of Limnæidæ, including all the genera and species found in Britain, except *Limnæa involuta*; Mr. P. T. Deakin, a specimen of *Loligo vulgaris*; Mr. H. Hawkes, a collection of *Helix nemoralis* and *H. hortensis*, from Perry Barr, showing a great variety of markings in so small an area; Mr. Linton, a Death's-head Moth, *Acherontia atropos*, taken at Smallheath.—June 2nd. Mr. H. Hawkes exhibited a collection of plants from Portland, including specimens of lungwort, *Pulmonaria officinalis*, also a collection of seaweeds from the same district; Mr. J. W. Neville, a sea-urchin, *Echinocardium pinnatifidum*, from Scilly Isles; Mr. G. Corbett gave a description of a geological visit to the quarries of Ludlow, and spoke of the "bone bed" as the deposit in which the first traces of fish remains are found: a collection of fossils from the district was shown; Mr. J. Collins showed pond snails, all of which were covered with a pretty alga, *Chætophora elegans*; Mr. White, fossils of *Trigonocarpum ovatum* in coal measure shale; Mr. H. Hawkes, under the microscope, slides of the rarer algæ in fruit.—June 9th. Mr. Deakin showed an unusual form of *Anodonta cygnea* from Cofton; Mr. G. H. Corbet, teeth of shark, *Otodus appendiculatus*, from Cambridge Greensand. Mr. J. W. Neville showed *Volvox globator*, and gave an account of some experiments he had made in transplanting microscopic organisms into convenient ponds. The attempt had been mainly successful, one pond yielding a plentiful supply of *Volvox globator* and *Melicerta ringens* where they had not previously been found. Mr. Thompson then read

a paper for Mr. A. E. Wright on "Comets." The occasional appearance and irregularity of the motions of comets caused them to be regarded by the ancients as precursors of disaster and calamity. A description was given of some of the more dreaded forms recorded in early times. Though the orbits of comets varied immensely, yet calculations concerning their reappearance demonstrated the fact that they obeyed laws similar to those of the solar system. Owing to their extreme tenuity, comets could not occasion alarm, even if they collided with the earth. The life of a comet was said to be limited and its death sure. The splendour of their visits to the sun wasted their substance, and thus perished these strange visitors to our system, shedding their dust in the inter-planetary space. The paper was illustrated by drawings.—June 16th. SPECIAL: BOTANY. Mr. H. Hawkes recommended the careful working of small botanical areas and exhibited a collection of mounted plants from the foot of the Chesil Bank, also a specimen of *Tragopogon pratensis* infested with three fungi, an Æcidium, Puccinia, and Ustilago; Mr. J. Collins, a collection of mosses containing twenty species of Hypnum; under the microscope, Mr. H. Hawkes, *Closterium lunula*; Mr. J. W. Neville, capsules of *Funaria hygrometrica*; Mr. J. Moore, gizzard of *Phyllobius argentatus*.

DERBYSHIRE ARCHÆOLOGICAL AND NATURAL HISTORY SOCIETY.—May 13. A meeting of the Natural History Section of this society was held in Smith's Rooms, Victoria Street, Dr. Greaves in the chair, when a paper was read by the Rev. J. M. Mello, M.A., F.G.S., on "The Dover Coalfield and its Connections." In the course of his remarks the lecturer stated that many years ago Col. G. Austen, and afterwards Professor Prestwich, came to the conclusion that productive coal measures very possibly existed concealed beneath newer strata in our south-western counties, but that it would have been found to have been connected before the breaking up of the measures into the separate basins in which they now lie with the South Wales and Somerset coalfields to the west, and with those on the other side of the English Channel in France and Belgium. Many things, the lecturer said, pointed to this conclusion, and there could be little doubt but that they once formed part of one great undivided area of coal bearing rocks, which, by subsequent earth movements, had been broken up into now isolated patches. A discussion followed the lecture, and the proceedings concluded with votes of thanks.

SEVERN VALLEY FIELD CLUB.—EXCURSION TO THE CORNDON.—The first field meeting of the Club for 1890 was held on Tuesday, May 20th. The weather being unpromising, only twenty-six members were present. The route was from Shrewsbury to Minsterley by rail, and from Minsterley to Corndon by carriages. After leaving Minsterley, the first point of interest was the quarry at Hope, where Silurian rocks rest unconformably upon the Ordovician. The President (Dr. Ch. Callaway) pointed out the horizontal stratification of the Silurian sandstones, and showed that in the lower part of the section the Ordovician shales were dipping at an angle. Further along the road, the Ordovician strata were seen in a very clear exposure to be highly contorted. At the Roman Gravels Mine the party was met by Captain Arthur Waters, who most kindly placed his services at their disposal, showing them first over the old workings of the Romans, and then explaining the different processes of crushing and washing by which the galena (lead ore) and the blende (zinc ore) were separated from their gangue, which consisted mainly of calcite (carbonate of lime),

but also contained quartz and barytes. The next visit was to the Hoarstones, a supposed Druidical circle, about half a mile further on, situated in boggy ground, and lying so low that it was visible only when the visitor was quite close. Here Mr. C. J. Cooper favoured the members with some extracts from Hartshorne's "Salopia Antiqua." When that writer visited the spot, in 1838, there were thirty-two of these stones, averaging from one to two feet above ground. They were placed five feet asunder, and disposed in circular order round a ring measuring from east to west 73ft., and 75ft. from north to south. Nearly in the centre stood a stone 7ft. in circumference and 4ft. high. Hartshorne was of opinion that the original number of stones was forty, corresponding with the circle at Keswick, and the second circle at Stonehenge. The President stated that the stones were of greenstone, similar to the rock of the Corndon, lying about two miles to the south. Mr. Cooper also gave an account of two other ancient monuments which lie in a line connecting the Hoarstones with the Corndon Mountain. These were the large circle at Mitchell's Fold, and the three stones, called the "Whetstones," which are grouped together at the northern end of the Corndon. It was suggested that the three groups were intended to represent a serpent, the Whetstones forming the head, the circle at Mitchell's Fold the middle, and the Hoarstones the tail, the connecting vertebræ being wanting; and it was supposed that these singular monuments were connected with serpent-worship. Further examination of these interesting constructions was, however, prevented by the rain. The members drove on to the Clive's Arms, at the foot of the Corndon. The rain now came down more and more persistently, and as the summit of the mountain was wrapped in cloud it was decided to abandon the ascent. The President had intended from the top of Corndon to give a geological description of the district. From this vantage ground an admirable view is obtained of the striking geology of South Shropshire and the adjacent counties. As the elevations correspond to the geological structure, it is easy to make out the chief features of the latter. Most of the mountain ridges trend from north-east to south-west. Along the eastern horizon runs the straight and elegant line of Wenlock Edge, composed of Silurian limestone. The next series of elevations is made by the sandstone bands of the Caradoc formation. Nearer to the eye runs the remarkable chain of hills of which the Wrekin and Caer Caradoc were the most conspicuous members, consisting mainly of Archæan volcanic rocks. Then follows the more softly rounded outline of the Longmynd Hills, formed of slates and sandstone, which also were probably of Archæan age. In the foreground the straight serrated ridge of the Stiper Stones is the chief feature, forming the base of the Ordovician system. Between this line and the Corndon run one or two parallel elevations, composed of the harder Ordovician rocks. The Corndon itself is a mass of igneous rock (greenstone), which has been intruded amidst shales and sandstones. On the west, several low parallel ridges indicate the position of beds of volcanic ashes interstratified with Ordovician strata. The elevated mass which culminates in the Longmynd Hills, the Stiper Stones, and the Corndon, is set in a framework of Silurian strata, which laps round the older rocks on all sides. The valleys intervening between the above-named ridges are excavated along bands of softer material, such as shale or slate. The physical features of the region were, therefore, usually determined by the superior hardness of rocks forming a succession of parallel zones. The unfavourable weather shortened the day's work, the Club returning to Shrewsbury by the 4 10 train from Minsterley, instead of by the 6 55, as previously arranged.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

ARRANGEMENTS FOR MEETING AT LEICESTER, SEPTEMBER 18TH AND 19TH, 1890.

The thirteenth Annual Meeting is fixed to be held at Leicester on Thursday and Friday, the 18th and 19th of September, under the presidency of F. T. Mott, Esq., one of the earliest and most influential supporters of the Union. The invitation proceeded from the Leicester Literary and Philosophical Society, the committee and members of which are doing their utmost to make the meeting a thoroughly succesful one. The presence of students of Natural History is cordially invited.

First Day.—The meeting will commence on Thursday, September 18th, when the members of the Union, their friends, and the guests of the Council will assemble at Belvoir Street Schools, Leicester, at two p.m. (entrance in Wellington Street).

2 to 2 30 p.m.—Members of the local society will conduct visitors over Leicester in four parties—(*a*) Archæological; (*b*) Archæological, to take reverse direction to above; (*c*) party to visit the parks, &c.; (*d*) party to visit the spinning mills.

3 30 to 4 30 p.m.—Afternoon tea in the Belvoir Street rooms.

4 30 p.m.—The Annual Meeting will be held, when the Report of the Council and the Treasurer's accounts will be received; the place of the next annual meeting proposed; any suggestions from members will be considered; and all necessary business and discussion of work for the coming year will be transacted. The President, F. T. Mott, Esq., will then deliver the inaugural address, the subject of which will be "Organic Death." A discussion will follow.

In the evening, from 8 to 11 o'clock p.m., a Conversazione will be held in the Museum buildings, at which the Leicester Literary and Philosophical Society has arranged for exhibitions of objects of great interest. A detailed programme will be issued with the tickets for the meetings. All members of the Union who have exhibits of special interest in their possession, or are able to obtain such, are requested to communicate at once with the Honorary Secretary of the Leicester Society, C. J. Billson, M.A., St. John's Lodge, Clarendon Park Road, Leicester.

Second Day, Friday, September 19th, will be devoted to Excursions, of which there will be two, viz.:—(*a*) Geological,

in open carriages to Charnwood Forest; (*b*) Botanical, in open carriages to Charnwood Forest.

Both parties will be under the guidance of members of the Leicester Society, thoroughly acquainted with the districts through which the parties will pass. A substantial meat tea will be provided at one of the Forest inns in the afternoon. There will be about twenty miles driving, and five miles walking (optional) in the course of each excursion.

Charnwood Forest is a remarkable group of hills, chiefly of volcanic and igneous rocks, offering various problems to the geologist, and containing many quarries and many craggy ridges. The scenery is picturesque and wonderfully varied, and the botany rich and interesting. There are several monastic and other ruins in the district; among them is Bradgate, the birthplace of Lady Jane Grey. The parties will return to Leicester in time for the 7 3 train for Birmingham.

Tickets for the entire meeting, inclusive of excursions, &c., 10s. 6d. each. No extras. Tickets for the first day only, including the conversazione, 4s. For the second day (excursion, &c.), 7s. 6d.

The Leicester Society will receive as guests as many visitors as they can, and this hospitality will be allotted according to the order in which applications for tickets are received. The number so allotted is necessarily limited, and for those who prefer it, or who cannot be so entertained, information concerning hotels and other lodgings may be had on application.

For the information of those who prefer to stay at hotels during their visit, the following list of the principal family hotels in Leicester is given:—The Royal, Town Hall Square; The Bell, Humberstone Gate; The Granville, Welford Place; The Wellington, Granby Street; and Cook's Temperance Hotel, Granby Street.

All who intend to visit Leicester will facilitate the arrangements, and help the local committee, by writing at once to the Honorary Secretary, Mr. Kineton Parkes, 61, Cavendish Road, Birmingham.

THE DOVER COALFIELD AND ITS CONNECTIONS.

BY THE REV. J. M. MELLO, M.A., F.G.S., ETC.

The recent discovery of coal in the south-east of England suggests questions of great interest, whether looked at from a strictly geological or from a merely economical point of view. The extent of the new coal area, the amount of workable coal

which it is likely to contain, the facilities for getting the same, as well as its quality, are all matters of the highest importance to the general public; whilst the geologist is interested in finding out, in addition to these things, the relation, if any, which this newly discovered coal area bears to other coal basins, and the conditions under which it assumed its present position. Many years ago Colonel Godwin Austen, and afterwards Professor Prestwich, had come to the conclusion that productive coal measures very possibly existed concealed beneath newer strata in our south-eastern counties, which would be found to have been connected, before the breaking up of the measures into the separate basins in which they now lie, with the South Wales and Somerset coalfields to the west, and with those on the other side of the English Channel of France and Belgium.

Various things pointed to this conclusion. Amongst others, it was observed that there was a very remarkable resemblance between the coal basin of Mons in Belgium and that of Somersetshire. In both we find a very remarkable disturbance of the measures, great contortion and even inversion of the beds having been produced by lateral pressure in both areas, whilst there is also the closest resemblance between the two coalfields in the mineralogical character of their rocks, both those of the coal measures themselves as well as those immediately underlying them.

Again, the line of strike of the Carboniferous rocks of Belgium and of French Flanders through the Boulonnais is such that when taken in conjunction with the remarkable resemblances between these Continental coalfields and those on this side of the Channel, we can have little doubt but that they once formed part of one great undivided area of coal-bearing rocks which, by the subsequent earth movements to which I have previously referred, has been broken up into now isolated patches.

That great line of upheaval, which has been called the Axis of Artois, can be traced, Professor Boyd Dawkins has pointed out, from Westphalia to Somersetshire and South Wales, and even as far to the west as south-east Ireland; the very remarkable results of the magnetic survey described by Professor Rudler show the presence of an underground elevation of old rocks in this district. This elevated ridge may be supposed to exist towards the east, buried beneath the Mesozoic and Tertiary rocks of the counties intervening between the western coalfields and the Channel. It is marked in these counties on the surface by the anticlinal of chalk which runs through Wiltshire, Surrey, and Kent; whilst borings

made in the neighbourhood of London have shown the existence of the Palæozoic rocks at varying depths below the surface. Thus, in a boring at Ware the Old Red Rocks were struck at a depth of 800ft. and Silurian beds at 1,289ft. The rocks of this buried ridge are tilted at a considerable angle, corresponding in this respect with the similar rocks in Belgium and France and in the Somerset coalfield. At Tottenham Court Road a sinking for water proved the presence of Devonian strata at 1,066ft. ; the same rocks were struck at Cheshunt, near Turnford, at 980ft. only ; whilst at Richmond the overlying Oolitic beds were proved to be very thin (87ft.), the Wealden being altogether wanting, and red rocks were pierced which might be either Triassic or Devonian, there not being sufficient evidence to show which. Other borings undertaken at Streatham, at Crossness, near Erith, and at Kentish Town, reached similar rocks at distances varying from 1,060ft. to 1,302ft., and further search in this area might possibly prove the existence of coal measures. In a boring at Harwich Carboniferous beds were found at a depth of about 1,030ft., but the coal measures themselves are absent, the rocks pierced being of older age, as was proved by the presence of Posidonomyæ in them. Passing more to the south, the Wealden was pierced in a deep boring near Battle, and at a depth of about 2,000ft. the rocks were of Middle Oolite age, any coal measures, therefore, which might underlie these would probably do so at so great a depth as to be quite unworkable, even if it were possible to find them.

If we now turn to the Continent we find that the great Palæozoic ridge which forms the Ardennes Mountains shows clear signs of its being a line of upheaval. We find there Devonian and Silurian rocks highly tilted, contorted, and even inverted and metamorphosed, facts which prove violent disturbance, and the coal measures in this district are consequently themselves greatly faulted and folded. The comparatively small portion now left of them lies in a narrow and broken band running from Westphalia, and which rests against the older rocks of the Rhine district.

Let us now trace these coal measures. The Belgian coalfield consists of a network of basins occupying the folds of the older Devonian and Silurian rocks, which may be traced from Prussia into France.

The Carboniferous formation in Belgium, as in this country, has three main divisions, the lowermost being the Carboniferous Limestone, the characteristic features of which are well seen about Dinant and the Valley of the Lesse, as well as in other parts of the country. This limestone is

overlaid by shales, grits, sandstones, and quartzites, above which come the coal measures, which are said to be richest in the European continent, having a great number of seams of coal, ranging in thickness from a few inches to as much as six feet. The coal is of a somewhat schistose character, some being composed even of extremely thin laminæ, whilst other varieties are compact, and others again earthy and pulverulent, and there is also a wide range in its nature as a combustible, all species from cannel to anthracite being found. There is one class of coals, known as "houille maigre," "terre-houille," or "téroule," which contains a large percentage of ferruginous clay, found amongst the inferior measures, and which is of very slow combustion.

We will now, taking our start from the Liège district, follow the coal measures along the left bank of the Meuse. They gradually decrease in extent, and are at last interrupted by the transverse valley of the Sanson. We find them again at Charleroi, but their area is here reduced from about 12,000m. to 8,000m. The coal measures cross the central part of Belgium, and they are struck to the west of Mons, where they are partly buried beneath more recent beds ; and, following them towards the French frontier to the west of Dour and Elonges, they dip beneath the cretaceous rocks. At Anzin they are found at a depth of 80m., the depth increasing as we go towards Denain, Aniche, Douai, Lens, and Bethune, where as much as 150m. of cretaceous strata overlie the coal measures. Then we come to the Valenciennes coalfield, which has been traced to within thirty miles of Calais at a depth of 1,104ft. In the Pas de Calais the concealed coalfield has been pretty thoroughly explored by means of numerous borings and pits. It occupies a constricted and not very productive area, cut off both on the north and on the south by Devonian rocks, which are found to lie immediately beneath the chalk.

Before attempting to follow the coal measures beneath the Channel, let us go back to Belgium, in order to obtain a clear idea of the nature of this once continuous coalfield.

The coal formation of this area occupies a long, narrow, synclinal trough, in which it has become more and more closely contracted, so that in the central and deeper pits the boundaries of the upper beds are said to form concentrically closed lines.

One of the central areas which received the latest deposits was that of Mons, of which the upper and more recent beds, characterised by a special quality of coal, known as "flenus," (cannel ?) are hardly found anywhere else. So the conclusion

to which we may come is that, at the time of its deposition, the valley extending from Namur to Douai contained but a narrow lake, beginning to the west of Mons and ending near Thuilin. There seems to have been a gradual contraction of the water-covered area, and consequently of the surface on which the coal-forming material was deposited.

The uppermost position of the cannel coals seems to confirm, it is pointed out, the mineralogical classification of coal according to the percentage of its gaseous constituents, beginning with cannel, the most gaseous and the least altered, and ending with the nearly pure carbon of anthracite, the oldest of the coals.

(To be continued.)

ON WEISMANN'S THEORY OF THE CONTINUITY OF THE GERM-PLASM.

Ever since the publication of "The Origin of Species," the subject of Heredity has occupied a foremost place in the speculations of Biologists, but up to the present no theory has been formulated that meets with general assent. Various hypotheses have been advanced, but owing to the complexity of the problem, or perhaps to the difficulty of proof, they have all remained in the form of provisional hypotheses.

Darwin, who saw the necessity of attacking the problem, devoted to it several chapters of his work on "Animals and Plants under Domestication." His theory of "Pangenesis," as he named it, presumed that each and every cell of the body gave off innumerable particles or gemmules, which, flowing from all directions, became concentrated in the germ-cells, giving them a complex composition of such a character that a single germ-cell could, under proper conditions, reproduce every detail of the parent organism. Each gemmule exerted its influence on the developing germ, and impressed it with the character of the cell from which it proceeded. This theory possesses the advantage of explaining the transmission of acquired characters, and the replacement of parts that have been removed by injury; a property that is conspicuous among the Reptilia, Crustacea, and lower Invertebrata generally. Notwithstanding the weight of the name of its great author, the theory has failed to find acceptance on account of the impossibility of conceiving how the gemmules are translated from the various places where they arise to the germ-cells; it cannot be by means of the blood, because, if so, the characters of one

organism could be communicated by transfusion of blood to the offspring of another. This was disproved by Mr. Francis Galton, who made a number of experiments upon rabbits for the purpose of ascertaining if this were the case. If not by the blood, by what other system could such countless gemmules, that are required by the theory, be transmitted in continuous streams to the germ-cells? In spite of this, however, this is still the simplest theory yet put forward to provide for the transmission of acquired variations.

Much confusion arises from the various interpretations placed upon the term "acquired character." Any character which an adult shows that happens to be a purposeful one, and which was not apparent in its progenitors, is put down as "acquired;" whereas the term should be restricted to those traits that have slowly increased in the individual by a reaction of the organism to some influence of the environment. Other traits that make their appearance late in life are probably potentially present in the germ.

In his "Principles of Biology," Herbert Spencer devotes a few paragraphs to the subject, but does not venture to make more than a sketch of a possible theory. His suggestion of certain polarities impressed upon the germ-cells by the body of the organism brings us little further on our way to the solution of the question, as supposititious polarities are no more an explanation than are the guiding forces of the teleologists; besides which if it were possible that the organism can impress itself upon the germ, the resulting product could not in any conceivable way be made to reproduce the structure that affected it, except by accident. Consider, how could an acquired character, such as the strengthening of the bone of a limb, even if it caused the re-organisation of the whole body and altered the supply of nourishment to the germ, affect it in such a manner that the tissue of the resulting offspring should be modified in exactly the same way. This is the crux of the whole matter. It is obvious that any change, however small, in the parent should affect the germ, but there is no reason to suppose that a disturbance of the nourishment should carry with it the likeness of a remote part. The disturbance experienced by the germ is not the same thing as the acquired character, and if it were, how is it conceivable that the homogeneous contents could be so altered by it that it should reproduce the cause of the disturbance in detail? The sensation conveyed to the brain through the medium of a sense is not the same thing as the external object stimulating that sense; similarly a physiological disturbance may have its proper effect, but

this will not necessarily be an effect in any way resembling its cause. Mr. Spencer says, that to assert that a re-organisation of any part of an organism has no effect upon its offspring, is to deny the "Persistence of Force;" but I cannot quite see how this follows, as the re-organisation may have its due effect in many other ways besides that of reproducing its image in the offspring.

Other important theories have been advanced by Strasburger, Naegeli, and W. K. Brooks, of Baltimore, but it is not here necessary to discuss them, as I do not wish to treat of theories of heredity in general, but of the "continuity of the germ-plasm," according to Weismann in particular.

Among the Protozoa, such animals as the familiar Amœba multiply by fission; that is, when they have arrived at the limit of their size they simply divide into two, so that the resulting animals are identical in size, structure, and properties. Of neither can it be said "This is the mother," or "This is the daughter," for both are just as old and in every way the counterpart of the other. If one were twice the size of its fellow, yet the fact of the similarity of age would invalidate the claim of the larger to be the mother. Being also the two halves of the original Protozoan, they are the same age as it was. This being the case, it follows, startling as the statement may seem, that every organism that has arisen by fission is as old as any of its predecessors, and in fact is as old as life itself. This will serve as an analogy to the "continuity of the germ-plasm;" still it is more than an analogy, it is the homologue of the process.

Guided by this, Weismann supposes that the nuclear substance—the essential part of the germ-cell—is passed on without alteration of quality, though of course increasing in quantity, from the parent organism to the offspring, where it reproduces its inherited structure. During the building up of the body, all (or some) of the germ-plasm is preserved, and is concentrated in the reproductive glands, where it is increased by nourishment, and then passed on to the next generation, still the same as when received from the original source, but with the addition of any variation that may have taken place in its own substance. I speak of variation in the sense of the so-called "spontaneous variation," as contrasted with variation through the influence of the environment.

The precise idea is difficult to express. In his lecture at Oxford, and subsequent paper in this magazine, Mr. Poulton used a diagram that makes the question a little more comprehensible, yet I do not think it advisable to adopt

it here, as it fails to express one or two matters that I think should be shown, and which are likely to give rise to dispute. I will refer to this later.

Commencing with the fertilised ovum, we see it presently divided into two cells, one of which (according to the theory) is set apart for the purposes of reproduction. Now Weismann supposes that this division is a division of the cell into two equal halves as regards quantity, but unequal in quality; that one of the parts retains a greater share of a certain property than the other. One of these further divides to form the body or Soma, while the other produces the reproductive gland; the property in which the latter has the advantage, being the germ-plasm.

Strasburger disputes this on the ground that the loops of the nuclear spindle after division, are exactly equal and similar in every way, and considers this an unanswerable fact on which he bases his own hypothesis; yet Weismann argues with very good reason that, notwithstanding their undoubted equality as shown to the eye under the microscope, yet the resulting cell-bodies may be different in size, shape, and subsequent history, so that one must possess something that the other does not.

His contention is supported by his recent observations on the Diptera, where the ovum is seen at the very commencement of segmentation to set apart a cell which subsequently becomes the reproductive gland. In this case we have the "continuity of the germ-plasm" in a nut-shell, or rather egg-shell.

As the theory does not admit of the possibility of the transmission of acquired characters, it is contended that the Natural Selection of spontaneous variations is sufficient for all change; that variations arise only by means of the mixture of the inherited characters of the male and female. Each ovum and spermatozoon contains within it the accumulated traits of a long line of ancestors, which by developing together are sufficient to produce variations without limit. The progeny of one pair of dissimilar individuals would in the tenth generation exhibit their traits in 1,024 different combinations, and as every creature has more than ten ancestors the scope for variation is practically infinite.

Then arises the question, "How did the first differences occur?" They are supposed to have made their appearance amongst the unicellular organisms, for as they are practically immortal they are always under the influence of the environment which impresses itself upon them, and any alteration it effects in them will be retained when they divide. Such a

differentiation as inside and outside, cell-wall and nucleus, &c., would be ample to start with. With multicellular individuals the only variations are those arising from the mixture of those previously produced in lower forms.

(To be continued.)

A FIELD-NATURALIST'S NOTES IN NORTH DEVON.

BY O. V. APLIN,
MEMBER OF THE BRITISH ORNITHOLOGISTS' UNION.

(Concluded from page 151.)

West of Ilfracombe the cliffs were inhabited by Stock Doves, which no doubt bred on the numerous ledges, or in the crevices. Seen from below, when the absence of the conspicuous white patch at the root of the tail would not be noticed, they might easily be mistaken, and no doubt often are, for the rarer Rock Dove. Here a Sparrow Hawk was sometimes noticed skimming swiftly along the cliff face, ready to snatch up an unsuspicious Linnet or plump Rock Pipit. Altogether, although birds were not numerous, nor of course conspicuous at that time of year, I managed to identify fifty-five species.

I don't think I ever saw so many Kestrels anywhere as in North Devon, two or three were often in sight at once, beating over the rough hill sides, and on one occasion I remember seeing four close together, wheeling round over a bit of cliff top above Combe Martin. The Buzzard, which still, it was pleasant to hear, breeds in the district, was not met with; but one morning the bird-stuffer's shop contained a very fine specimen in the flesh, which had been trapped near Brandon. The same man had also recent examples of the Raven, which still lingers. I did not fall in with one alive, but was more lucky with another species of the *Corvidæ*, which I had hardly hoped to see. I had ascended the Little Hangman from Combe Martin one morning. A rather conical hill, for some distance it rises almost perpendicularly from the sea, which surrounds it on three sides. Half way up I had dropped down among the sheep-bitten gorse bushes to watch the evolutions of a pair of Kestrels, which were carefully beating the hill-side, utterly unaffected by the stiff westerly breeze which made one's precarious footing on the short, slippery turf doubly difficult to maintain. They were, probably, feeding on beetles or some other insects, as they

repeatedly swooped down to the ground and appeared to be occupied for a few minutes with some small object, the nature of which my glasses did not reveal. Having reached the top—some 750 feet—and enjoyed the grand sea view, I was coming down again when a sharp, ringing cry arrested my attention. The cry was essentially *corvine* in character, but I knew at once that the sound was fresh to my ear, and, guessing the origin of it, I hurried to the edge as fast and as near as I dare. Fortunately I was in time to see half-a-dozen glossy blue-black birds, with widely separated primaries, flying round the bend of the cliff wall far below me. As they passed with undulating buoyant flight, one, turning upwards, showed the orange-red bill of the Chough (*Pyrrhocorax graculus*). Perhaps these were a wandering band, for although there are on this range of cliffs certain spots which Choughs are known to frequent pretty regularly, the Little Hangman is not one of them; and in the case of a local, and, it is feared, decreasing species like the present, it would, perhaps, be unwise to indicate the precise situation of these favoured habitats. Suffice it to gladden the heart of the enthusiastic field ornithologist to know that he can still meet with this interesting bird on the cliffs of North Devon.

In Devonshire, ferns generally absorb the amateur botanist's attention. That it should be so is only natural in a county so rich in this class of plant, and in which Harts-tongues and the Maiden-hair and Black Spleenworts, with many another, clothe the hedge banks like weeds. And who can forget the ferny glories of the Hobby Walk at Clovelly! But for my part I always prefer the flowering plants.

In August many interesting plants have flowered and are over, and the sightseers gather with a reckless hand whole bunches of any showy flowers. But a few things still remain to interest the naturalist accustomed to the flora of the Midlands. On the cliffs we have the Thrift (*Armeria maritima*) in abundance, with delicate pink flowers, *Filago germanica*, the Carline Thistle (*Carlina vulgaris*), the Dwarf Tufted Centaury (*Erythræa littoralis*), and the Broad-leaved Centaury (*E. latifolia*). The rough stony places yield magnificent plants of the Giant Mullein (*Verbascum Thapsus*), Foxglove (*Digitalis purpurea*), Perfoliate Yellow-wort (*Chlora perfoliata*), and Buck's Horn Plantain (*Plantago coronopus*). In the hedges we find the Tutsan (*Hypericum Androsæmum*) abundantly; also the Golden-rod (*Solidago Virgaurea*), and the broad deep-green, sword-shaped leaves of the Stinking Iris (*Iris fœtidissima*). Among the rocks at Morthoe I gathered the true Samphire (*Crithmum maritimum*), a very different plant

from the little Glasswort (*Salicornia herbacea*), which is known and pickled as Samphire on the Norfolk coast, where it grows in profusion on the mud flats. Here, too, was the Spathulate Sea Lavender (*Statice spathulata*). At Clovelly the common London Pride (*Saxifraga umbrosa*) grows freely, and wild to all appearance; and the handsome Red Spur Valerian is common on old garden walls.

One day was devoted to visiting Stanton Sands and Braunton Burrows. Leaving Morthoe Station a footpath across the fields leads one down to Woolacombe Bay. Here, just out of reach of the sand, on a piece of waste ground, the Burnet Rose (*Rosa spinosissima*) grows in abundance. The long three mile stretch of level sand along which our course lies, burning hot in the blazing noonday sun, was relieved only by some plants of the purple Sea Rocket. with thick fleshy leaves, a single Curlew, wary as ever, and a few Herring Gulls. Ascending the high ground, where Baggy Point juts out far into the sea, I leave the coast for a while, and find myself in a land of cornfields, and homestalls, and orchards, interspersed with rich greenswards, pasturing the red-brown Devon cattle. Through the narrow lanes, bordered with high, fern-clothed banks, topped with straggling hedges, and shaded with tall elms meeting overhead, on past Patsborough, and then down a long deep lane to Croyd. In the leafy tree tops I could hear the Cirl Bunting's sibilant song, but the birds kept closely hidden. A path taking one by a short cut to the sands over the intervening high ground, pointed out by the obliging innkeeper at Croyd, having ended in a turnip field at the summit level, whence the yellow sand hills of the Burrows could be seen shimmering in the sunlight down below, I took a straight line down the hill side, crossing several of those huge curious Devon fences, so pretty to look at and withal so horrible to get over.

I had been led to expect numerous botanical treasures at Braunton, but my time was too limited for an effectual search, and I was disappointed in the flora. Among other things, the Sea Lavender (*Statice Limonium*) is said to grow there, but from what I know of its muddy habitats in East Anglian salt marshes (where a stretch of marsh is often one mass of Lavender blossom), I should say the portion of the Burrows I investigated was too sandy for it. As it was, the locality yielded the tiny Dwarf Centaury (*Erythræa pulchella*), Sea Spurge (*Euphorbia Paralias*), Small Bugloss (*Lycopsis arvensis*) Viper's Bugloss (*Echium vulgare*), and a small variety of the Rest Harrow (*Ononis arvensis*). In wet places near the edge of cultivated ground, grew the Small Skull Cap (*Scutellaria

minor), a rather rare plant except in the West of England; and the air was sweet with masses of wild mint.

There are swarms of Rabbits on the Burrows. At high spring tides numbers of these apparently perish, for their bleached skulls and bones lie about in all directions. Flies swarmed over the surface of the warm, bare sand in the hollows, and Swallows were eagerly skimming up and down within a few inches of the ground. The Wheatear, which loves a lonely spot, was here, and a few Meadow Pipits. The tide was far out, and had left a huge expanse of wet glistening sand. Near the tide edge a large herd of Curlew (*Numenius arquatus*) were feeding, and four compactly-shaped little waders skimming along the edge are shown by my glasses to be Turnstones (*Strepsilas interpres*). Their expanded wings, prettily mottled with white, and the large patch of the same on the lower back, makes them rather conspicuous. The air was calm, and the sea outside like glass; yet the heavy Atlantic rollers of the ground swell came thundering in to break on the level sands with a sullen roar, heard far away inland. What wonder, then, that the hollows among the sand-hills are often strewn with wreckage, and that we see to-day the timbers of many a ship which have found a resting-place here. There might have been more species of wading birds about, although it was yet early in the season, but they were all so wild that it was impossible to get anywhere near them on the bare sands at low tide. And at that time, too, I had not the experience of the call notes of the various species which has been subsequently gained during long days spent in pursuit of shore birds in the salt marshes. Beyond the two just mentioned, the only other wader I actually saw in Devon was the Common Sandpiper, an example of which I flushed when walking along the bank of the Taw, at Barnstaple. But Ringed Plover, Whimbrel, and perhaps Redshank, passed over Ilfracombe on migration at night.

The lines of migration, or the routes taken by birds on their vernal and autumnal travels, lie, when practicable, for the most part along the sea coast. It is, therefore, well worth the naturalist's while, when he happens to be there at one of the periods of migration, to keep a sharp look out for birds passing over at night, at which time the migrations take place. Especially watchful should he be on dark or thick nights, when the birds fly at a much lower elevation than when the weather is clear and the sky starlit. The various wading birds will be chiefly noticed, and an acquaintance with their call notes, which they utter almost incessantly, is

of course necessary for their identification. I was lucky enough to observe migrations taking place on five nights, and was able to identify several of the species engaged in them. On the 15th at 9 30 p.m. (wind S.S.E., fresh, weather thick with driving rain, moon not up), a party of Common Sandpipers flying due east; another little party a quarter of an hour later. On the 18th, about the same time (dark, weather thick, but clearing, wind W.N.W., nearly calm), Ringed Plover and Common Sandpiper flying west, calling loudly. On the 21st, 12 15 midnight, birds (not identified) flying over the town. 22nd, 10 20 p.m. (calm, starlight). Whimbrel flying west. 23rd, 10 p.m. (starlight), birds flying over the town, only Redshank doubtfully identified. Except when the air is calm birds prefer to fly against the wind, or across and partly against it. In some cases this question of the wind causes an apparent retrogression in the general direction of the autumnal migration, *i.e.* south and south-west. So in the case of the Common Sandpipers on the 15th, whose direction of flight would take them up the Bristol Channel. Unless they crossed the land higher up, they would have to return the same way to reach the south coast.

Anxious to learn what species usually passed down that part of the coast, I questioned the obliging keeper of the Bull Point Lighthouse, some few miles west of Ilfracombe, who sends in returns to the Migration Committee of the British Association. From him I gathered that few birds ever struck the light. The lighthouse stands in a very exposed position, and the lantern is 154ft. above the sea, so that the birds would not easily miss it. But the light is a revolving one, giving three flashes in the half minute, with a corresponding period of obscurity, and in the keeper's opinion far more birds would strike if the light were fixed. The few that he noticed generally consisted of Blackbirds, Thrushes, and Starlings. In looking through the report of the migration committee for that year I find that on the 24th September a number of Willow Wrens and Whitethroats were observed, on the 5th October a Lark struck, on the 26th and 30th a Blackbird, and on the 31st six of the same species struck the light.

The Swifts left Ilfracombe early. On the 15th August a number of them were flying round St. Paul's Church, but they had all disappeared the next day, and a straggler on the 20th was the only one I noticed after that date. That they should have left this locality, with its mild climate, so soon is rather curious, and must be attributed to its western position, for on my return to North Oxfordshire, I heard that Swifts continued numerous there until the 19th, and a few were noticed on the following day.

But the time came all too quickly when I also had to migrate and to join the great stream of tourists who were hurrying back to their winter quarters along the Great Western line of migration. And so, one morning, instead of going up to sun ourselves on the cliffs, and drink in the freshness of the soft, salt Atlantic breeze, we journey down to Barnstaple, and in due time exchange the twitter of the Linnets and Martins, the insect hum, and the gentle sough of the sea, for the rattle and roar and thunder of the great express, which carries us through the fair west country, until, when the afternoon is waning, we get out at the busy Berkshire junction to branch off in a northern direction towards our own Midland habitat.

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(Continued from page 165.)

We now enter on the last chapter in our history, *viz.*, the period from the year 1851 to the present time. I prefer to treat of it at once, and to reserve for future discussion the new records of the previous half-century.

We commence with the 2nd edition of the "Botanical Looker-out" of Mr. Edwin Lees. The 1st edition was published in 1842, the second in 1851. This work contains a description of the vegetation characteristic of each month in the year in various parts of England and Wales; the 2nd edition including, among others, a few Worcester records. Among these the most interesting are those contained on p. 181, in a description of the vegetation of Sapey Brook, especially of that part of it between Upper and Lower Sapey, in the parish of Clifton-on-Teme. Among a long list of rarities Mr. Lees gives the following additions to the Malvern Flora.

* **Geum urbanum.**

Geum intermedium.

* **Carex strigosa.**

This is the first notice of Geum intermedium as a Worcester plant. My herbarium contains a specimen from the Sapey locality, gathered in May, 1848.

The 2nd edition of Mr. Lees's "Flora of the Malvern Hills" bears, at the end of the preface, the date "August, 1852." We are introduced in this volume to many botanists

whose names deserve honourable mention as contributors to the Botany of Worcester. They are the Rev. Canon Cradock, Rector of Tedstone Delamere, since Master of Brasenose College, Oxford; the Rev. J. H. Thompson, of St. Nicholas, Worcester, since Incumbent of Cradley, near Halesowen; Mr. Thomas Baxter, second Master of the College School at Worcester; Mr. Thomas Westcombe, and Mr. Thomas Reece, Curator of the Worcester Museum. I was connected by ties of personal friendship with most of these gentlemen, and have to lament that all but Mr. Westcombe have joined the majority.

ED. LEES, "BOTANY OF THE MALVERN HILLS," 2ND EDITION, 1852.

(Most of the plants recorded in 1st edition omitted.)

* **Berberis vulgaris**, 43. Near Leigh Sinton. Mr. Westcombe.

Barbarea præcox, 64. Road side by New Pool. Gathered by Mr. T. Westcombe, 1846.

Lepidium sativum, 64. Naturalised in many spots.

* **L. Draba**, 64. At Powick, on the embankment of the new road, west of the iron bridge, where it has flourished for nine years. See "Phyt.," Vol. I., p. 679.

* **Viola canina**, 39. *Here identified with Viola sylvatica of Fries.*

V. pumila, 39. "What I formerly called flavicornis." *A small form of the last.*

‡ **Dianthus barbatus**, 45. Naturalised in the little wood at the Wells for many years. *Not British.*

Lychnis vespertina, 46.

L. diurna, 46. *First recognised as segregates in this edition.*

* **Rhamnus catharticus**, 1st edition, p. 18; 2nd edition, p. 39. In hedges near Madresfield. *Accidentally omitted from 1st edition list in "Mid. Nat.," Vol. XII., p. 141.*

[* **R. Frangula**, 1st edition, p. 18. Omitted in 2nd and 3rd editions.]

* **Ulex Gallii**, 66. Great autumnal furze. *The first Worcester record of this species under its real name. See "Mid. Nat.," Vol. X., p. 255. Purton, Appendix.*

*† **Genista pilosa**, 67. Mr. Borrer has recorded gathering this rare plant by the road side between Malvern Wells and Little Malvern, but it is not now to be found there. *Query—Where is Borrer's record? See Lees, "Mid. Nat.," Vol. XI., p. 278.*

* **Lathyrus Aphaca**, 67. In an arable field by the side of Cabbage Lane, Powick. Mr. T. Baxter.

Orobus tenuifolius, 67. *(Var. of O. tuberosus.)* Seats Common, Malvern.

* **Alchemilla arvensis**, 67. Arable fields. Common.

Rubus plicatus, 57. Birchen Grove, Worcester.

R. cordifolius, 57 = *R. rhamnifolius, 1st edition.*

*R. Lindleianus, 57 = *R. nitidus, 1st edition. See "Phyt.," Vol. III., p. 361.*

R. incurvatus, 55. Thickets between Cowleigh and Worcester.

R. vestitus = *R. leucostachys, 1st edition.*

R. amplificatus, 56. In most of the woods between Malvern and Worcester.

‡ R. Schlechtendalii, 56. Cowleigh Park. *Hereford.*

‡ R. macrophyllus, 56. Cowleigh Park. *Hereford.*

* R. Hystrix, 56 = *R. pallidus, 1st edition.*

R. scaber, 53. Woods on the old Storrage.

†R. argenteus, 56. Hedges near Cotheridge. *It is doubtful what species is intended here.*

* R. pampinosus. Lees 55, is *R. villicaulis, W. and N. See Babington's "British Rubi," p. 141*

R. dumetorum (*diversifolius*), var. ferox, 50.

R. cæsius, var. pseudo-Idæus. Rushwick, near Worcester, 50.

R. Lejeunii, 52. Plentiful in a dingle on the north side of Rough Hill.

R. Guntheri, 51. Crow's Nest Wood, in profusion.

R. Bellardi, 51. *Var. of R. glandulosus.*

R. hirtus, 53.

* R. tenui-armatus. Lees 51. *R. Schleicheri, 1st edition. R. Balfourianus, Blox. See Bab. "Brit. Rubi," p. 255.*

R. Wahlbergii, Arrh, 50. This is R. corylifolius var. purpureus of *Bab. " Brit. Rubi," p. 267.*

* R. sublustris, 51. *This is the typical form of R. corylifolius, Sm.*

* Geum rivale, 58. Sapey Brook.

* Geum intermedium, 58. Upper Sapey, near the bridge over the brook. " Bot. Looker-out," 1851, p. 181.

Epilobium virgatum *(E. obscurum)*, 44. Mr. Westcombe.

Myriophyllum alterniflorum, 73. In little pools on Welland Common.

Callitriche pedunculata, 73. In pools on Danemoor, Welland Common. *Probably C. autumnalis of the 1st edition.*

Sedum Telephium, var. purpureum. In a field close to Laughern Brook, Bubble Bridge. Worcester. *I presume that Sedum Fabaria, Koch, is intended here. See Syme, E. B., Vol. IV., p. 50.*

* Bupleurum rotundifolium, 41. In a field at the top of Folly Copse, Alfrick.

* Œnanthe Lachenalii, 41. In the Welland Marshes; also in Longdon Marsh.

Tragopogon minor, p. 69.

Lactuca Scariola, 69. At Longdon Hill End south of the path from Welland.

Sonchus asper, 69.

Hieracium umbellatum, 70. In Crow's Nest Wood, St. John's.

* **Jasione montana**, 38. Rosebury Rock, Knightwick.

* **Vinca major**, 38.

Erythræa pulchella, 38. Gathered by Mr. G. Reece on the side of a lane between Alfrick Chapel and Grimsend House. Also near Malvern; Mr. T. Westcombe. *I am indebted to Mr. R. F. Towndrow for specimens of this species gathered by him near Malvern Link, on the 6th August, 1885.*

† **Scrophularia Ehrharti** ? 62. There is a Scrophularia in the Herb. Nat. Hist. Soc. at Worcester, with cream-coloured flowers, that appears to be this species. It was gathered near Alfrick Chapel, by Mr. G. Reece, in 1845. *But Mr. Lees adds in the 3rd edition.* "My friend Mr. T. Westcombe, who has critically examined it, thinks it only a var. of S. aquatica." *(Certainly S. aquatica, Mr. R. F. Towndrow.)*

* **Limosella aquatica**, 63. On the margin of New Pool; by a pool on Newland Common. On Welland Common.

Veronica Buxbaumii, 34. On Malvern Link and near Stanbrook.

Orobanche minor, 63. In a field at Lower Wick, 1847. (*Malvern, August, 1884. Mr. R. F. Towndrow !*)

Mentha sativa, 60. "Near Worcester." Herb. Nat. Hist. Soc.

* **Origanum vulgare**, 61. In woods at the western base of Keysend Hill; also at Cruce Hill, Alfrick.

* **Echium vulgare**, 36. A rare plant in the Malvern district. In a field below the eastern side of the Herefordshire Beacon. Mr. G. Reece. Also on Ankerdine Hill, 1847.

Primula vulgaris, var. caulescens, 38.

Chenopodium album, var. viride, 42.

[**C. botryoides**. Recorded in 1st edition, p. 20; omitted in 2nd and 3rd editions. *It was probably an error.*]

Atriplex erecta, 75.

A. deltoidea, and **var. microsperma**, 75.

Rumex conglomeratus, 45.

R. sanguineus, var. viridis, 43.

* **R. pulcher**, 43. The locality given in the 3rd edition is Castle Morton Churchyard.

Polygonum mite, 44. Has been gathered at Boughton near Powick. *No authority given.*

* **Salix Helix**, 74.

S. stipularis, 74.

S. acuminata, 74.

‡ **Narcissus incomparabilis**, p. 79, footnote. Stated by my late friend, J. Roby, Esq., to be naturalised in some places about Malvern. *Not British.*

† **Potamogeton heterophyllus**, 79. In a pool on Welland Common. In the 3rd edition, p. 107, Mr. Lees adds, "This is dubious, leaves only observed."

P. prælongus, 79. In a pool on Barnard's Green, below Devil's Oak Lane. *This is a very doubtful record. Mr. Lees notices it in the 3rd edition, p. 40, as one of the plants previously unrecorded in the Malvern district, but omits it from the Potamogetons on p. 107. He omits it also in the " Bot. of Worc.," 1867.*

Juncus glaucus, 80. Not recorded in 1st edition.

Juncus obtusiflorus, 80. Welland Marshes.

* **Scirpus acicularis**, 77. In various damp marshy places on Barnard's Green and Welland Common. Plentiful on the edge of Garret Pool.

‡ **S. lacustris**, 77. In the Ledden near Ledbury. *A Hereford record.*

***Carex cæspitosa**. 1st edition, 48; 2nd edition, 82. Is recorded as C. vulgaris in 3rd edition, p. 113.

* **C. strigosa**, 82. See " Bot. Looker-out," p. 181.

Alopecurus fulvus, 77. On the borders of New Pool.

‡ **Avena pubescens**, 78. On the side of the Ridgeway, Eastnor Park. *Hereford.*

* **Molinia cœrulea**, 78. Crow's Nest Wood.

Bromus commutatus, 78.

Lolium multiflorum, 79. In cultivated fields. Introduced.

*‡ **Botrychium Lunaria**, 87. In a field on the north side of the road, at the base of the Herefordshire Beacon, west of Wind's Point. *Hereford.*

(*To be continued.*)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL SECTION. June 3rd. Mr. W. B. Grove, M.A., in the chair. Mr. Geo. Lavender exhibited three branches taken from the same tree, growing in his garden, of the hybrid laburnum, *Cytisus purpurascens*; these three branches represented respectively the common yellow laburnum, the true *C. purpureus*, and the hybrid, having the racemose inflorescence of the former with the purple colour of the latter. Mr. J. E. Bagnall, A.L.S., showed several coloured plates of new Warwickshire Fungi from Dr. M. C. Cooke; also an illustrated Chart of the Mosses of Europe, by Gümbel. Mr. W. R. Hughes, F.L.S., presented to the society a copy of the portrait of Miss Constance C. W. Naden, for which a vote of thanks was passed to R. Lewins, Esq., of London, and to Mr. Hughes. Mr. W. R. Hughes, F.L.S., read a paper on " Corals, Coral Builders, and Coral Islands." He gave a description of the polypes and showed diagrams of their structure, explaining how they live and form the coral. He then gave an account of the probable manner in which coral islands are formed. He exhibited sections of coral under the microscopes, a collection of typical recent corals, and a delicate specimen of red coral in spirits, showing the eight tentacles of each polype beautifully expanded. Mr. F. W. Carpenter exhibited some fine specimens of coral. Mr. W. H. Wilkinson also exhibited specimens of fossil and recent corals, and some beautifully mounted thin sections of fossil coral from America. After an interesting discussion, a hearty

vote of thanks was passed to Mr. Hughes.—EXCURSION. June 7th. The members of this society made a very enjoyable excursion to Broadway, and as the weather was ideally perfect, and Mr. J. Levick, the secretary of the excursion, had, with the most delicate forethought, provided for every contingency and anticipated every wish, the day will be long remembered by the members of the party. They assembled at Snow Hill Station at 10.15, to the number of about fifty ladies and gentlemen, including Mr. W. B. Grove (ex-president of the society), Mr. W. H. Wilkinson (vice-president), Messrs. T. Levick, G. Heaton, J.P., H. Heaton, J. Heaton, W. P. Marshall, M.I.C.E. (gen. sec.), W. R. Hughes, F.L.S., &c., and proceeded to Honeybourne, whence, the problem of packing in brakes and carriages having been successfully accomplished, they drove to the fine old hostel, the Lygon Arms. A capital lunch had been provided, and after justice had been done to it—for even men of science must dine—the party strolled up to the tower, some 1,050 feet high, whence a magnificent view was obtained, and thence through flowery fields and lush meadows back to the inn to compare notes, discuss a cup of tea, and then to drive into Evesham for the 7.32 train. Although thoughts and observations on scientific subjects were freely exchanged, the day was one less of scientific work than of social intercourse among friends with a community of tastes and pursuits. The botanists, however, managed to turn up a few interesting plants, among them being *Listera ovata* (the tway-blade), *Hippocrepis comosa* (the horse-shoe vetch), *Reseda lutea* (mignonette), *Reseda Luteola* (dyer's weed, or weld), and *Briza media* (the quaking-grass). The entomologists found *Thanaos tages* fairly common, *Euclidia glyphica*, *Euchelia jacobææ*, and a few other things that were worth "boxing." When the day came to a close there were indications in the farewells of a resolution like that of Burns's "Twa Dogs," when

> "Each took aff his several way,
> Resolved to meet some ither day."

—SOCIOLOGICAL SECTION. SUPPLEMENTARY MEETING. June 24th. Mr. W. R. Hughes, F.L.S., in the chair. Mr. Bolton exhibited a plasmodium from Sutton Park. Mr. Hughes exhibited, on behalf of Mr. C. T. Parsons, a portion of a boulder of quartz from a lane at Olton, near Birmingham, also a number of plants gathered on the carboniferous limestone, near the Wrekin, including *Ranunculus ophioglossifolius* and *Sanicula europæa*. Mr. Herbert Stone exhibited shoots of Abies, the base of which had been altered and hypertrophied by the irritation of an aphis (*Chermes Abietis*). The abnormal growth had assumed the form of a fir-cone with a shining surface, from which short rigid leaves arose. The margins of the base of the leaves were bordered with a beautiful scarlet velvety pile.—SUPPLEMENTARY MEETING. June 26th. Mr. W. R. Hughes in the chair. Mr. Kineton Parkes called attention to a new individualistic publication called the "Whirlwind." Mr. Herbert Stone read his paper on "Weismann's Theory of the Continuity of the Germ-plasm," in which he reviewed the various theories of heredity and contrasted them with it. After expounding the theory and calling attention to the points which commended it to the notice of biologists, he brought forward and discussed the chief arguments against its acceptation. An interesting and animated discussion followed, in which the President, Mr. W. B. Grove, Mr. Wainwright, Miss Dalton, Mr. Buncher, and Mr. Spears took part. The President announced that the section would not meet again until October next.—BIOLOGICAL SECTION. July 8th. Mr. W. R.

Hughes in the chair. Mr. Chas. A. Loxton was elected a member of the society. Mr. W. H. Wilkinson exhibited a geranium blossom three times proliferous, the lower cluster of blossoms being mixed with small leaves. Mr. Herbert Stone exhibited, for Miss Gingell, some beautiful specimens of Bee and Frog Orchis, *Ophrys apifera* and *Habenaria viridis*, from Dursley, Gloucestershire.—Geological Section. July 15th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Exhibition of specimens: Mr. J. E. Bagnall, on behalf of Miss Gingell, *Orobanche rubra*, *Monotropa hypopitys*, and variegated leaves of Ulmus. Mr. Udall, specimens of various minerals, put at the disposal of members of the section by Mr. W. P. Marshall, M.I.C.E.; *Campanula media*, with calyx becoming petaloid.—Sociological Section. July 22nd. Mr. W. R. Hughes, F.L.S., in the chair. Mr. Hughes exhibited, for Mr. Harry Heaton, specimens of abnormal foxglove, *Digitalis purpurea*, being an example of synanthy in which the terminal flower was cup-shaped, formed from the union of several ordinary blossoms. Mr. W. H. Wilkinson also showed, under the microscope, a section of the carpel, or seed vessel, of a large blossom of a similar kind, in which about thirty clusters of seeds could be seen, occupying the place of two clusters in the normal flower. Mr. W. H. Wilkinson exhibited a blossom of the African marigold, which had produced nine smaller blossoms, each on a stem, grouped around the central blossom, some of which were double, some semi-double and others single.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION. June 23rd. Mr. Hopkins exhibited a curiously distorted specimen of *Limnæa stagnalis*; Mr. H. Hawkes, *Æcidium urticæ* with cups of abnormal length; Mr. J. W. Neville, skin of Australian fish, *Monocathus granulatus*.—June 30th. Mr. J. W. Neville showed specimens of *Monograptus Sedgwickii*, a fossil of Llandovery age, from Wales; also specimens of *Spirula Peronii*, from the Indian Ocean; Mr. J. Madison, fossil corals from Carboniferous limestone, Wellington; Mr. G. H. Corbett, quartz crystals containing cavities filled with gaseous or liquid substances; also a few fossils from the Cambridge greensand; Mr. Cardwell, thrush's eggs showing a striking difference in colour, the spots of one being on the thin end; Mr. Parker, Calcite crystals and galena. Under the microscope, Mr. J. Moore showed sections of fossil woods.—July 7th. Mr. J. Collins exhibited fossil ferns, &c., from Oldbury; also, for Mr. Deakin, a collection of plants from Bournemouth; Mr. Hawkes, for the editor of "The Naturalists' Gazette," plants from Penzance; Mr. Linton, a monstrosity of *Plantago media*, the flower stalk being surmounted by a cluster of foliage leaves in place of the flower spike. Mr. H. Spears then read a paper on "Some Modern Aspects of the Developmental Theory." The writer first called attention to some of the earlier philosophers who had foreshadowed the great modern theory of evolution, amongst whom were Aristotle and later Erasmus Darwin. Buffon hinted there might be some importance in the theory, whilst Linnæus, on the other hand, saw no reason to doubt the permanency of species. France first, in the person of Lamarck, introduced to the world in a tangible form the theory of the evolution of the higher from the lower forms of organic life. But it was not till 1858 that serious attention was given to the subject, through the works of Charles Darwin. The diligent labours of Darwin, Wallace, Herbert Spencer, Romanes, Grant Allen, and others, were referred to at some length. Darwin's theory of Natural Selection and the survival of the fittest was very carefully expounded.—July 14th. Mr. J. A. Grew

read a paper on "Art and the Naturalist." The writer said if all naturalists would use their knowledge to the beautifying and enriching of art, it would remove the stigma so often applied them of mere faddists. No school of art existed that did not assume to interpret nature. The idea of the Gothic artist was aspiration, and the true principle of art was the interpretation of some natural fact. When an artist forgot this principle his craft was near its end. The paper dealt with the subject under two divisions, pictorial art and decorative art; the first only depicted what the artist saw, the latter made use of conventional treatment. All scientific students should be free with their criticisms when nature has been outraged in art. The writer concluded by saying Natural History Societies had been of great use to art in popularising the forms and beauties of living objects, and giving taste to those who had studied nature less than themselves.

DUDLEY AND MIDLAND GEOLOGICAL AND SCIENTIFIC SOCIETY.—On Tuesday, July 1st, the Society made their second excursion to several places of interest on Cannock Chase. They met at Rugeley, where Mr. Fairley, mine agent to the Marquis of Anglesey, showed them some magnificent photographs of sections taken from the different collieries on the Chase belonging to the marquis. These photographs, four in number, he afterwards very kindly handed to the Secretary of the Society, to place in its museum at Dudley. The party first walked to the old Church, which is now a ruin, although the chancel is used for early prayers. The tower and chancel are old, early English, probably about the date 1240. The Chapel is of the early decorated or geometrical period. The east wall of the north Chapel has the mutilated remains of what appears to have once been a richly moulded and carved reredos, rising high up into the three-light window. The arcade on the north side of what was once the nave now stands in the churchyard by itself. Carriages took the members to Longdon Church, where two very fine specimens of Norman zig-zag arches and the font, which is very ancient, were noticed. The bottom of the font consists of a capital from Lichfield Cathedral. Beaudesert Hall, the seat of the Marquis of Anglesey, was next visited. This place was formerly the property of the Bishop of Chester, and afterwards came into the possession of the Paget family. The first Lord Paget was created in 1549, and was in great favour with Henry VIII. He was consulted by that monarch as to the legality of his marriage with Catherine of Arragon. In 1714 the then Lord Paget was created Earl of Uxbridge, but this latter title died out in 1769, and the estates went to a distant cousin, together with the title of Lord Paget. The chief interest centred in the celebrated Marquis of Anglesey. Amongst his valorous deeds, his exploits at Waterloo entitle him to rank next to the Duke of Wellington. At the end of the battle he received a wound in his leg, by almost the last shot fired, and it was found necessary to amputate it. The pictures, of which there are two by Snider and four by Ommegauck, a Dutch painter, and another of the Battle of Waterloo, by Devius Dighton, were much admired. The camp at Castle Rings was the next object of interest. This camp, Dr. Plot imagined was the work of the Danish King Canute, when he made his incursions into this country, or else that it might have been cast up by the Mercians in their own defence. Mr. Pennant suspected it to be an ancient British post, and since the researches of Mr. Duignan, the result of which appeared in the "Midland Antiquary," December, 1885, it would appear that the latter is the more correct view. With the help of Mr. Duignan's paper, it was explained that

Cannock Chase was a hunting ground of our early kings, who sometimes resided here. The hunting lodge is supposed to have been in Courtbank Cover which is quite close to the Castle Rings. Within the ring are the remains of a building about the history of which little is known, but it is supposed to be the site of a priory where were located Monks of the Cistercian Order. This monastery was known as Radmore, and was probably a hermitage in its commencement. The walls of this building, of which only a small portion has been excavated, are 4½ feet in thickness. In addition to these interesting facts, it should be mentioned that the traces of other ancient buildings have quite recently been discovered, while ploughing operations were being carried on in a field near. The whole subject of these ruins is one of much interest, and affords a field for archæologists to examine. The view, one of the finest in the Midlands, which can on clear days be seen from the Castle Rings, was much spoilt by the weather being unfavourable. The carriages conveying the members proceeded from the Castle Rings to the ballast pit on the side of the Cannock and Rugeley Railway. A stop was made here to examine this exceedingly fine section of the conglomerates of the Bunter. At several points the scoria from ancient smelting of iron ore was noticed. On arriving at the Shrewsbury Arms, Rugeley, the party found an excellent meat tea awaiting them, and they afterwards left by train for their various destinations after a most enjoyable day.

OXFORD NATURAL HISTORY SOCIETY.—May 28th. The Rev. J. G. Burch gave a lecture on "The Architecture of the Atoms," which was illustrated by models symbolising the different combining powers of the various elements. Thus, hydrogen, having one affinity, was symbolised by a ball; oxygen, with two affinities, by a little stick, (its *two* ends); carbon, with four affinities, by an equilateral tetrahedron. Each symbol represented an "atom" of the particular element, and the different ways in which the figures could be fitted together, taken to pieces, and put together again, symbolised the behaviour of the "atoms" and "molecules" of the elements in their combination, disintegration, and re-combinations. The models were, in fact, the presentation to the eye, in a form easy to be seen and remembered, of what the usual chemical formulæ attempt to do. The whole thing was extremely ingenious, and rendered a very abstruse subject fairly intelligible.—June 10th. Mr. F. H. Peters read a paper on Goëthe," as a naturalist and evolutionist. In this Mr. Peters brought out very clearly, and in a very interesting manner, a side of the character of the poet which is often overlooked, and showed how greatly indebted modern science is to Goëthe for some of the philosophic ideas which underlie the theory of evolution.—July 8th. The President, Mr. E. B. Poulton, F.R.S., gave a lecture on "Colour in Connection with Courtship." The lecturer chiefly dealt with the evidence in favour of Darwin's theory of sexual selection, which depends on the existence of an æsthetic sense in the higher animals—say down to the arthropoda. The sufficiency of the evidence as to the existence of such a sense has been denied by Wallace. That no large amount of evidence does exist may be mainly attributed to two causes—the difficulty of observing the courtship habits of animals in a wild state, and the fact that the observation of naturalists, where possible, had been as yet little directed to this point. The observation of domesticated animals might be of little use, their habits and perceptions having become so altered by man's dealing with them to produce results to his satisfaction, not theirs. A telling instance of this

degeneration was given in the relative weight of brain and body in the wild and domestic duck; in the latter case the brain having been reduced to half its weight in relation to the body weight. It had been well said that two thousand years' association with man had reduced the bird to a state of idiotcy. The lecturer showed that there is a good deal of indirect evidence of the existence of the æsthetic sense—for instance, as a rule, males are more beautiful than females in the animal kingdom; in some cases, however, where the females take an active part in courtship, and the males are coy and exercise selection, the females are the more ornamentally coloured. This is the case with the common white butterflies in England, the Meadow Brown, the Grayling, and some of the Hairstreaks. Another class of indirect evidence was drawn from insects. Where the females can be shown to have degenerated (and probably lost the æsthetic sense), the beauty of the male disappears. Instances of this, in a descending scale of degeneration, are to be found in the Emperor Moth, the Vapourer, and the Psychidæ. Examination of the pupæ shows that the females of the first once possessed highly developed antennæ; of the second, fully developed wings: of the third, the ordinary appendages of a perfect insect. These have been lost in course of time, and a corresponding loss of brightness of colour has taken place in the males—the Emperor being little changed, the Vapourer retaining only the one white spot of a once varied pattern, the Psychidæ having grown uniformly dingy. Some direct evidence from insects was then adduced, based on the observation by two American naturalists of the extraordinary attitudes assumed in courtship by the males of a genus of spiders (Attidæ). These varied from the ostentatious display of some highly coloured portion of the body to the evolutions of an intricate dance. The females manifested a very decided opinion indeed as to the artistic merits of these courtship dances, and the fate of the unsuccessful postulant was generally to be eaten on the spot. (Some lantern slides were afterwards shown illustrating some of the most remarkable of these attitudes). Since Darwin's time the evidence of the presence of the æsthetic sense in two well-known cases has been considerably strengthened—one is the discovery of the part played by its highly decorated wing spots in the courtship of the Argus pheasant, large prepared circuses having been found in the Malayan Islands, with special perch occupied by critical female, and separate entrance, from which the males successively defile to display their attractions before her. The other is the discovery of a new Bower Bird in New Guinea, with artistic proclivities developed far beyond those of its Australian relative. This bird constructs conical huts of a species of Epiphyte, producing leaves and flowers long after its building into the hut, faces this with a carefully laid mossy lawn, to be in its turn decorated with bright shells, flowers, and fruits, regularly removed and replaced as they fade. All this simply for use as a kind of assembly room, having nothing to do with the economy of nesting, which is conducted in trees. Final facts adduced as telling against Wallace's theory of intensity of colour being due to superabundant vigour and vitality were—The existence of bright colour only in species which are abroad when colour can be seen—not in night-flying birds and insects; the absence of bright colour on the wings of such species as vibrate them so rapidly that the colours would be indistinguishable, *e. g.*, humming birds; and the presence of these colours on the wings of slow-flying species; the presence of colour disposed in such lines and bands as to be seen to most advantage by the female when the male is approaching her, *i. e.*, from the head backwards.

THROUGH NORWAY WITH THE VESEY CLUB.

Amongst the countries which the British nomad overruns during his restless season few or none have grown in favour with such remarkable rapidity as has the so-called "Land of the Midnight Sun." Owing, on the one hand, to the width of the silver streak and the terrors of the Dogger, and, on the other, to the difficulties of locomotion in the country itself, it will probably never enter into serious competition with the present "playground of Europe;" but, while thus the number of inland visitors will remain relatively restricted, it needs small skill in prophecy to foresee a huge extension of the present yachting system, whereby, with a minimum of labour, a minimum of responsibility, and a minimum of inconvenience, the best parts of Norwegian scenery, its western fjords, can be visited and enjoyed. But Norway has other interests, even exceeding that of her unique scenery. Her people, bound by ties of common blood to our own, kindly and courteous, hospitable to strangers, and, despite the evil influence which American and English tourists always leave in their wake, even yet more friendly to the visitor than to the visitor's gold; her mountains, lakes, and valleys, exhibiting phenomena of metamorphism and of glacial action with the most remarkable beauty; her flora, surpassingly rich in Alpine, boreal, and Arctic types, and telling, with no uncertain voice, a tale which is as strange as the wildest speculations of the geologist; all combine to make Norway as intensely interesting to the naturalist as she can possibly be to the sightseer. Hence I feel bound to forgive my co-editor for the suggestion that the recent visit of the Vesey Club to Norway, combining, as it did, serious scientific work with pleasure, may have features of interest to the readers of the "Midland Naturalist," and to comply with his otherwise scarcely appreciated request that I should give some account of it for our pages. I must premise that this sketch can be in no way formal or complete, even as regards the scientific part which I myself had the opportunity of playing, and those who wish for a fuller account of the scientific results of the expedition will have to wait for the *Report* which will be issued hereafter under the auspices of the Vesey Club.

It may not be amiss in the first place to say a few words as to the Vesey Club itself, for, although this excursion has caused considerable sensation, in London as well as in the Midlands, the Club is too young for its nature and objects to be clearly known.

The Vesey Club, then, simply described, is an association of persons with literary, artistic, or scientific tastes, who

meet periodically for their mutual improvement by the consideration of some special topic. Through force of circumstances, the Club has more marked tendencies in the geological and botanical directions than in any others, but this is of the nature of a perhaps temporary accident. Thus far the Vesey Club differs in no way from the many literary and scientific societies scattered over the country. Two characteristic features, however, are its social tendencies, and the desire of its members to be on terms of personal friendship with one another. To promote these the membership is limited. The head-quarters of the Club are at Sutton Coldfield, the name being taken from the Bishop Vesey who was such a splendid benefactor to that Royal borough. The originator, life, and soul of the Club is Mr. J. B. Stone, F.L.S., F.G.S., Mayor of Sutton Coldfield since prehistoric times, who himself exemplifies in the happiest manner the associated characteristics of the Club. An earnest scientific student, with decided literary and artistic tastes, Mr. Stone is nevertheless most in his element in exercising the genial duties of host. An active politician, his politics have never been allowed to interfere with his friendships, and, indeed, but for current reports and newspaper evidence, one might associate with him for years without learning the nature of his political proclivities. What the founder and senior vice-president of the Vesey Club can do would take pages of the "Midland Naturalist" to state. What he cannot do I must still, after a long and careful study of him, leave to the future to find out. The President of the Club is, for the current year, Sir Robert Ball, the well-known and genial Astronomer Royal for Ireland. Previous Presidents have been Archibald Geikie, Director of the Ordnance Survey, and W. Carruthers, head of the Botanical Department of the British Museum, and President of the Linnean Society. As each President reigns for a year the age of the Vesey Club is readily told.

The excursion to Norway was the outcome of a scientific discussion at one of the meetings of the Club, and the superfluous energy of the senior vice-president found a temporary vent in organising it. How perfect the organisation was only those who took part in the excursion can form any idea, and even they hardly an adequate one. The primary division of the party was into two, those who wished to spend four weeks, and were anxious to make a more careful examination of the best marked geological and botanical features of the inland districts, and those who could give only two and a half weeks, and were, on the whole, more drawn by scenic attractions. The former party left Birmingham on Friday, June 27, and

Hull the same night, going by steamer to Christiania, arriving early on Monday morning, proceeding thence *viâ* the Dovrefjeld to Trondhjem. The second party sailed from Leith on Wednesday, July 9, in the s.s. St. Rognvald, which had been chartered for the purposes of the excursion, and went *viâ* Bergen and Molde, to Trondhjem, at which port the overland section joined them on Sunday, July 13. Thence the combined party came southwards, through the finest of the fjords, and with inland excursions at various points of interest, finally reaching Leith on Thursday, July 24.

The overland party, all told, numbered twenty-six. The components were Mr. and Mrs. J. B., Miss, and Mr. B. Stone, Prof. Lapworth, Dr. H. W. Crosskey, Mr. and Mrs. T. F. Ash, Mr. Joel Cadbury, Dr. Wilson Duckett, Dr. and Miss Fraser (Wolverhampton), Miss May Greener, Miss Griffin (Wolverhampton), Mrs. Hillhouse, Mr. and Mrs. Thos. and Mr. T. S. Hooper, Mr. J. A. and Miss E. Jones, Miss May and Miss Phœbe King, Mr. C. H. Pedley (Crewe), Mr. C. J. Watson, Dr. Charles Wilson (Crewe), and the writer. A special carriage conveyed the party to Hull; but while conveying them thither I feel impelled to explode a very pretty fable with regard to an accident which is supposed to have befallen the leader. On two different occasions it has been stated in one of the Birmingham daily papers that Mr. Stone was left behind at one of the stations *en route* for Hull, and had to be conveyed on by a "special." Even the amount he had to pay for the special is circumstantially given, and the reader is likewise informed that, the line being duly cleared, the lost leader reached Hull before his sorrowing companions. The whole story is a pure fiction.

It is necessary before going further to note that, though nominally included in the overland party, my wife and I, owing to certain difficulties in the way of winding up my work at the Mason College, were unable to accompany them. We left Hull four days later, and, travelling *viâ* Gothenburg, as described shortly, joined the rest of the party on the Dovrefjeld. As to the effects of the fifty hours' sea passage upon the party I therefore know nothing, excepting by hearsay. I am told, however, that it was somewhat rough. For the same reason, as this is a "first-hand" narrative, I am compelled to pass rapidly over the two or three days they spent in Christiania, merely outlining their route, and making a few comments. It must be acknowledged that the party had a somewhat exceptional experience of Christiania, for the day of their arrival was also that of the arrival of the German Kaiser, and the city was in high jinks. Turned out of their

own hotel, the "Victoria," by the Kaiser's suite, the party had to take as a substitute the "Grand," but as compensation for this a place was given them on one of the official steamers which went down the Christiania Fjord to meet the German vessels, and they had an opportunity of interpolating an English "hurrah" amongst the volleys of sharp Norwegian "h'ra"s. I understand, too, that they gave a dinner in Christiania, to which were invited numerous notables, political, literary, and scientific, that they kept the festivities up till—well, never mind what time in the morning—and that, in the words of the *portier* at the Grand Hotel, "they all got very jolly," but, for the good repute of my friends, I hasten to explain that the expression did not bear quite the significance that would be liable to be attached to it in England.* A railway ride from Christiania to Eidsvold, at the southern end of the Mjosen Vand (Lake), and a steamboat trip along the length of the lake, and the party reached Lillehammer, where the land journey proper began. From Lillehammer to Trondhjem is approximately 200 English miles. The road first traverses a valley known as the Gudbrandsdal, and at about half-way, at Domaas, it bifurcates, the direct line being continued W.N.W. through the Romsdal, giving thence water communication with Molde, and another road striking away to the north by east, over the high table-land of the Dovrefjeld, till it ends, as before said, at the ancient capital Trondhjem. Taking this latter road the party reached Jerkin, on the highest part of the Dovre, on Saturday, July 5th, and at this point we ourselves had arranged to join them.

I have already said that we were unable to start with the overland party, and as the steamers to Christiania run only once a week, it was necessary for us to select some other route. Ultimately we chose a boat from Hull to Gothenburg (Göteborg) in Sweden, leaving Hull early in the morning of Wednesday, July 2nd, reached Gothenburg early on the morning of Friday, and left it by train, for an all-night journey, the same evening. A wet morning at Gothenburg was followed by a fine afternoon, and gave a welcome opportunity for a walk. Gothenburg is an undeniably interesting town, situated a few miles up the Göta River, and intersected by several broad canals, giving to it a strikingly Dutch

* One point of special interest with regard to this dinner I must mention. While it was going on, the Norwegian Storthing, or Lower House of Parliament, was holding a sitting, and at the dinner the announcement was first publicly made that during the sitting the Storthing had voted the sum of 200,000 krone (£11,000) for a new polar expedition, under the guidance of the famous Greenland traveller, Dr. Nansen.

appearance. Like all Scandinavian towns, though hardly to such a great extent as some, it is largely built of wood. A capital view of the place, and of the district in which it lies, is to be obtained from a hill called the Utsigtsplatz, about three-quarters of an hour's walk away, one of a large number of bare, rugged, gneissic hills, dropped all over the district, and forming numerous islands off the coast.

A glance at a good map of Norway will show that at the time we landed in Gothenburg the overland party were already a couple of hundred miles to the north of Christiania, while we were 220 miles to the south of the same place. It was our wish to overtake our friends at the earliest possible moment, and an actual stern-chase was entirely out of the question. Our plan then involved a night journey to Christiania, then, by means of the new railway from thence to Trondhjem, making our way up the valley of the Glommen to a station known as Lille-elvedal, which is somewhere over fifty miles by a cross-road from Jerkin. This involved about twenty-two hours' railway travelling, and twelve hours' driving, in two days and two nights, and this programme we carried out.

A night journey is never particularly enjoyable, and the route from Gothenburg to Christiania involves few points of interest. All the Scandinavian trains are slow, and therefore give ample opportunity for studying the *facies* of the country you traverse, *e. g.*, the mail train by which we travelled, and which once a day connects Copenhagen with Christiania, has an average speed of a little over twenty miles an hour. The first object of real interest is the very finely wooded and picturesque valley of Tröllhatten (45m.), in which, a mile and a half or so below where the train crosses the river, are the famous Falls of the Göta, known by the same name. Afterwards you get one or two glimpses over scraps of the great Lake Venern, for though it is between ten and eleven o'clock your capacity for seeing distant views is only a little restricted, since we were in latitude 58½°, on a level, that is, with the extreme north of Scotland. There is nothing, however, worth seeing, and I should advise a traveller to snatch, if possible, a few hours' sleep. To this, however, a Swedish railway hardly lends itself. The carriage (first class) is comfortable enough, and indeed might give points to an English equivalent. A passage runs down one side, and the residue is divided into compartments, like to those of an English carriage, windowed on the outer end, but entered only from the passage, and the passage itself is only entered from the ends of the carriage. Under the middle window is a "flap" table, on the back of which stands a decanter of water and a

couple of glasses, and in a vase is a bunch of roses. The compartment is lighted by the electric light, with a switch under the control of the passenger, and in the winter is heated, the heating being likewise under control. One of these compartments was secured to ourselves, and the seats were provided with suitable sleeping appliances. It is not, therefore, the carriages which are disposed to drive away sleep from any but the hardened traveller; the fault lies probably with the permanent way. At any rate, the noise and jolting were sufficient to neutralise the effects of but a couple of hours' sleep during the previous night, and to render possible only an occasional doze. Before 2 0 a.m. we crossed the Norwegian frontier, and had made rather more than half our journey. The traveller should, however, be sure to wake up, or ask the guard to wake him, in time to see the magnificent Sarpsfos, at Sarpsborg, a waterfall in which the whole of the huge volume of the Glommen river, by far the largest river in Norway, pours over a ledge of rock about fifty yards in width and seventy-five feet in depth. The railway crosses the river almost vertically over the fall. The train now approaches the Christiania Fjord, and at Moss I would suggest that the traveller should leave the train and take a small local steamer which starts shortly afterwards for Christiania. The Fjord, as I can vouch from personal knowledge, is well worth the trouble of turning out at 4 0 a.m. In our case, however, it was again raining fast; views were therefore impossible, and we remained in the train, satisfying ourselves with lovely glimpses from time to time as we approached Christiania and the showers intermitted.

At Christiania we had Saturday morning at our disposal, and just as our friends found themselves in the thick of the Kaiser's arrival, so we had what the Americans expressively call "a front seat" at his departure. His is an interesting personality. In my younger days I used to discuss at a debating society questions of the highest politics, and more than once considered the relative advantages of "freedom" and a "benevolent despotism." There is more than a suggestion of a benevolent despotism about the Kaiser's rule, and there are few, perhaps none, more interesting questions in contemporary politics than the future of his method. It is telling an old, old tale to say that, personally, he is not half so good looking as his photographs. A fine-looking man, facially, is King Oscar, who sat by his side and exerted himself, somewhat ineffectually, to arouse his subjects' enthusiasm. The Norwegians are a democratic people. Monarchy in the abstract is not popular with them, and in the concrete it is decidedly unpopular. The marriage of Norway and Sweden

has not been a happy one,—about as grateful to the Norsk as would have been to the Scots the union of the crowns of England and Scotland on the one head of James, had the latter happened to have been primarily an English king. All sorts of funny dodges are made use of to avoid friction. For instance, in Sweden, Oscar is King of Sweden and Norway; in Norway, King of Norway and Sweden, and so on. But still the Norwegians are not happy, and I suppose it must be ever thus when a poor but proud and well-born dame is wedded by *force majeure* to a plump, wealthy, but with all, plebeian husband. Unless hampered by his personal interests, probably not one Norsk in a hundred but would welcome a divorce, not one in ten but would gladly rejoin the old mate, Denmark, or, failing that, rejoice over the establishment of a Norwegian Republic. Hence the departure was rather limp. The Norwegian cheer, "h'ra," as I have before designated it, does not lend itself to unorganised out-door effects. It is striking enough when shouted in perfect time, as we subsequently heard it, by a party of officer-guests at Vossevangen, but with a heterogeneous crowd in the streets it is ineffective. Matters were not improved by frequent showers.

Shortly after noon we were once more in the train, *en route* for Lille-elvedal, two hundred miles up the valley of the Glommen. To Eidsvold (42 m.) our route was the same as that of the overland party. Thence we had frequent glimpses to the left over the great Mjosen Vand, the largest lake in Norway, about sixty miles in length, though comparatively narrow, and often a mere slit between the hills. The shores are generally undulating, but sometimes abrupt and well wooded; this is particularly the case about fifteen miles down, where the Skreiakampen, on the western side, rises to a height of about 2,300 feet, and opposite to it the lake is about 1,600 feet in depth. About half-way down the lake, on a bay of its eastern side, lies the town of Hamar. Here we change our train, for thus far we have come upon a railway having the usual European guage, but from this station to Trondhjem the line is a narrow guage, with a width of 3ft. 4in. A halt of half-an-hour gave time for dinner. A railway dinner in Norway is a meal by no means to be despised. With the exception of the soup, which is ladled out by the attendants of the railway restaurant, you help yourself to everything, and, after liberal recourse to huge dishes of delightful mountain strawberries, with cream to match, which you use for the purpose of filling up any crevices which may remain and steadying the meal for

subsequent railway jolting, you pay for the whole 1 kr. 50.* This is not, perhaps, cheap, but the appetite of a Norwegian traveller is enormous.

After taking an easterly course for an hour or so, the railway strikes the valley of the Glommen, turns sharply to the north, following the river, to which it clings pretty closely for the next hundred and fifty miles, and as in this distance the river falls approximately 1,500 feet, its rapids and cascades form an ever-changing item in the scene. The whole valley of the Glommen is densely wooded, almost entirely, as far as one could see, with *Abies excelsa*, the well-known Norway pine. The whole wealth of this district lies in its wood, which, felled in autumn and winter, is sent down the river in the spring floods of May and June. In our journey early this morning we passed, at Fredrickstad, by the side of mile after mile of huge timber stacks, for Fredrickstad lies by the mouths of the Glommen, and the barkless trunks which are sent down the river are there collected, and claimed by their owners, whose private mark is placed upon the broader cut end. As we go along this and other timber streams of Norway we constantly come across trunks, stranded upon shoals, left behind by the diminishing floods, and waiting, dumb and patient signs of the industry of thousands, for the floods of another spring to carry them again on their downward way. How often do people resemble these trunks, hesitating while the flood of fortune is at its height, and at length, emboldened by the success of others, launching themselves on the waters, too late ; only to be left by the retiring floods amongst the flotsam and jetsam of commercial civilisation, in a place whence they are not worth the cost of endeavouring to rescue them,—but without "next year's floods" to look forward to. The tail of a flood is the happy hunting ground of the company promoter.

At Lille-elvedal we leave the train, just before midnight, and spend the rest of the night in preparation for a hard day's work on the morrow.

The morrow came, and with it the rain. For twelve long hours we drove through a pitiless, ceaseless downpour,

* A krone, coinage of the three kingdoms of Denmark, Norway, and Sweden, is 1s. 1½d. English money, and is divided into 100 ören. When the coinage was reorganised, in 1875, it is a pity that the German mark, or English shilling, was not adopted as a standard. The measures are a trifle perplexing ; *e. g.*, while the kilometre is a standard of length in all three countries, the "foot" measure is still used for measuring heights, at any rate in Norway and Sweden. The Norwegian is about ⅛in. shorter, and the Swedish ⅛in. longer, than the English foot. The mile of Norway is equal to seven English miles, that of Sweden about 600 yards shorter.

ascending mile by mile the valley of the Elv, thrice changing horses, but only once, at Dalen, nine hours after starting, getting anything more sustaining than coffee, and a queer, wafery, rolled up tube, which is one of the Norwegian rural equivalents for biscuits. At last, shortly before half-past ten, and within a few minutes of the time at which I had intimated my expectation to join our friends, we drove up to the doors of Jerkin, and were received with open arms and a good square meal by the overland party. I have a strong objection to working on Sunday, and a still stronger objection to causing others to do so; on this occasion, for what I thought sufficient reason, I waived both of these objections. The Sabbatarian may rejoice in the fact that of all the wet days of a wet holiday this Sunday was far and away the wettest. Instead of the glorious views which we ought to have had over the range of the Rondane Mountains, which our route bounded on the north, we had only one or two half-hearted glimpses of the nearer peaks, late in the evening, when the rain thinned off a little. Our descent into Jerkin—I say descent, for though Jerkin lies at 3,140ft. above sea level, we had just crossed a ridge probably 500ft. higher—had been observed from the windows of the station while yet we were a mile or more away, and much was the speculation as to whether it was "we, or not we." Two fragments of circumstantial evidence the upholders of the former theory had to go upon; firstly, I had telegraphed from Gothenburg, five hundred miles away, that we hoped to join them on that evening by about half-past ten; secondly, that no sane person, who didn't consider his mission urgent, would be driving across the high fjeld after ten at night on such a day as it had been.

(To be continued.)

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(Continued from page 187.)

We must now return to the "Phytologist," Vol. IV., Part 2, 1852.

At page 715 we find an account of the proceedings of the Phytologist Club, 25th September, 1852, at which the President, Mr. Edward Newman, announced, *inter alia*, the following discoveries of plants:—

* **Dianthus deltoides.** Cookley, near Kidderminster; Mrs. Bennett Williams. Blackstone Rock, near Bewdley; Mr. Thos. Westcombe. Concerning this station Mr. Westcombe writes, under date September 21st, 1852: "Although I have sought for Dianthus deltoides for a great many years at Blackstone Rock, I never could find it till this year, when, happening to be in flower, it was conspicuous among the grass." *First noticed in this locality by Dr. Sheward, 1799. See "Mid. Nat.," Vol. X., p. 172.*

‡ **Poterium muricatum.** Worcestershire. Mr. Thomas Westcombe. No locality. *It appears from Mr. Lees's Botany of the Malvern Hills that the locality was at Colwall, in Herefordshire.*

Filago apiculata. Worcestershire. Mr. Thos. Westcombe. No locality. *In the Botany of Worcestershire, p. 46, Mr. Lees writes:* "Near Hartlebury Common. I give this critical species on the authority of my friend, Mr. T. Westcombe."

* **Osmunda regalis.** Gathered last week at Lower Broadwater Forges, near Kidderminster. *Name of contributor not mentioned. In the Botany of Worcester, p. 9, Mr. Lees says that it was discovered at Cookley, by Mrs. Bennett Williams, of Worcester. Cookley is obviously an error, arising from confusion with the locality for Dianthus deltoides. This fern was gathered by the writer on the 29th July, 1853, at Comberton, near Kidderminster, a few yards south of the Bromsgrove turnpike road, in a ditch leading towards the Hoo Mill. It remained a very short time in this locality.*

At pp. 817-25 we find "A Descriptive List of the British Rubi," reprinted from Mr. Lees's "Botany of the Malvern Hills." At p. 917 Mr. Lees points out that this list included the Malvern species only. He describes other British forms, including the following records for other parts of the county of Worcester:—

Rubus pyramidalis, Bab. Shrawley Wood and Wyre Forest. *Described by Mr. Lees as a var. of R. Menkii, W. and N. Not so considered by other botanists.*

* **R. scaber,** Weihe, var. **verrucosus.** Bromsgrove Lickey. This remarkable bramble is referred by Professor Babington to R. fusco-ater. See British Rubi, p. 216.

R. Sprengelii. Bromsgrove Lickey.

At pp. 970-1, "Proceedings of Phytologist Club," 28th May, 1853, among other communications, is one from the Rev. J. H. Thompson, on the Worcestershire species of Lepidium, in which he announces the discovery, in October, 1852, of

Lepidium latifolium, close to the River Salwarpe, near Droitwich.

He also mentions, as naturalised about Worcester,

Lepidium sativum.

At p. 981, Phytologist Club, 28th June, 1853, the President read a communication from Mr. Lees recording, on the authority of Mr. W. Chesshire, jun., the occurrence of Udora

(*Elodea*) canadensis in the Avon, at Stratford, Warwickshire. This is described in the contents, p. vi., as Udora canadensis in *Worcestershire.* There is a history of this plant as occurring in Britain in the *Worcestershire Chronicle* of the 31st August, 1853, in which it is stated that Mr. Chesshire found it in the Avon, at Evesham, in June, 1853. *This is the first Worcester record.* It is also stated that the plant was found by the late Mr. Thos. Baxter in a pool near Bevereye, on the 19th August, 1853.

At p. 983 is an account of the proceedings of the Botanical Society of Edinburgh, 14th April, 1853, at which Professor Babington distinguished the two British Thymes, T. Serpyllum, L.. and T. Chamædrys, Fr. The existence of two Thymes in Britain was first observed by George Jordan, butler to the late James Fryer, of Bewdley, who pointed out to me the two forms in or about the year 1844. Jordan had an extraordinary knowledge of the plants of Wyre Forest, and was always ready to act as guide to the botanists of that time.

A note by Mr. George Jordan on the occurrence of the two Thymes at Bewdley will be found at p. 1142, and may be accepted as the first Worcester record for

Thymus Chamædrys, Fr.

The next work to mention in this history is "Stanley's Worcester and Malvern Guide Book." "Worcester, printed by John Stanley, Sidbury." There is no date on the title page, nor at the end of the preface, and it is only by internal evidence that we arrive at the conclusion that it was published in 1853. On p. 144 we read that the last Triennial Musical Festival was held in August, 1851; on p. 197 the rainfall is given to the end of November, 1852. On pp. 160 to 171 is a list of Flowering Plants and Ferns, indigenous to the neighbourhood of Worcester, the more remarkable only having been inserted. We learn at p. 148 that this list was furnished by that excellent botanist, the late Mr. Thomas Baxter, with the aid of Mr. Edwin Lees, the Rev. J. H. Thompson, and Mr. T. Westcombe.

The list contains 227 species, from which I select the following:—

* **Myosurus minimus.** Pool at Helbury Hill; E. Lees. Bank of Droitwich Canal, near Porter's Mill; Rev. J. H. Thompson, 1852.

* **Helleborus fœtidus.** Lane near Bransford Chapel.

* **Sisymbrium Sophia.** Northwick. Mr. T. Westcombe.

Barbarea præcox. Broadheath.

* **Dianthus Armeria.** Battenhall; Kempsey Grove; Shoulton Lane; Hallow, &c.

* **Geranium pyrenaicum.** St. John's.

* **Genista anglica.** Broadheath; Moseley Green; Hallow.

* **Medicago maculata.** Smith's Hopyard, Lower Wick; near ferry, beyond Old Waterworks; Porter's Mill, &c.

Trifolium ochroleucum. Cotheridge. *See "Mid. Nat.," Vol. X., p. 284.*

* **Vicia bithynica.** Under Cruckbarrow Hill. Mr. Gissing, 1852.

* **Lathyrus aphaca.** Powick, Mr. Baxter, 1847; Hatfield, near Norton, Mr. L. Sutton, 1845; coppice half a mile beyond Crowle Turnpike, J. R. Sheppard, 1834; in all three localities in 1852.

* **Petroselinum segetum.** Spetchley.

* **Cnicus eriophorus.** Powick; Kempsey Grove; Hill Top, Cotheridge.

* **Verbascum virgatum.** Ombersley Road, opposite Perdiswell.

* **Veronica Buxbaumii.** Discovered by Miss Sheppard in a field near Bubble Bridge, in 1850, when it was plentiful there.

* **Lamium incisum.** Near Earl's Court, St. John's. Ed. Lees.

* **Rumex maritimus.** Bank of Severn, below Worcester Bridge, &c.

* **Juniperus communis.** Bush Hill, Powick.

* **Sparganium natans** (*S. minimum, Fries, is intended here.*) Muddy pools at Cotheridge. E. Walcot, Esq. *See "Mid. Nat.," Vol. XI., p. 206.*

* **Hydrocharis Morsus-ranæ,** New Road, St. John's; Diglis Meadows, Kempsey, &c.

* **Epipactis purpurata.** Nunnery Wood. Discovered by Mr. Baxter, in 1849, and named by C. C. Babington, to whom specimens were sent. *This must be the same species as the Epipactis purpurata of Smith, discovered by the Rev. Dr. Abbot, at Noris Farm, near Leigh, Worcestershire. See "Mid. Nat.," Vol. XI., p. 59. It has been referred by Prof. Babington to Epipactis violacea, Dur. Duquesnay; Manual, 8th Edit., 1881.*

* **Neottia spiralis** *Spiranthes autumnalis*). Cruckbarrow Hill.

* **Convallaria majalis.** Birchen Grove; Monk's Wood.

* **Ornithogalum umbellatum.** Pitchcroft; Broad Heath.

* **Juncus compressus.** Canal side. *See "Mid. Nat.," Vol. XII., p. 204.*

* **J. squarrosus.** Broad Heath.

Scirpus Tabernæmontani. Pool at Northwick Brick-kilns.

* **Carex axillaris.** Near Norton. Mr. T. Westcombe.

* **Calamagrostis Epigejos.** Perry Wood; abundant in Monk's Wood.

Avena pubescens. Meadow near Bubble Bridge.

(*To be continued.*)

ON WEISMANN'S THEORY OF THE CONTINUITY OF THE GERM-PLASM.

(Concluded from page 178.)

The theory certainly gains support from observed cases, for amongst animals that propagate themselves by parthenogenesis or other asexual means do not vary, for instance those Saprophytes that have been so ably investigated by Dr. Dallinger. It occurred to me that his experiments would throw much light on the question, and I fortunately had the opportunity of asking him how these monads multiplied, and under what circumstances the variations, which he so successfully obtained, took place. He kindly informed me that they usually multiplied by fission with occasional sexual generations; but that no variations or deformities occurred, except at the sexual generations. This would seem to prove that the former proposition, that unicellular organisms may be altered by the environment, is incorrect. If no change occurred during multiplication by fission, the environment apparently had no share in the wonderful changes necessary to accustom a species to a temperature ninety-seven degrees above the normal, except to select suitable variations as they arose at the sexual generations.

One great objection to the theory is the difficulty of imagining how all the variations, necessary among highly developed forms for a single step forward, can arise simultaneously. Take for example the oft-quoted instance of the giraffe. Let us suppose that an increase in the length of the neck has been brought about by some fortuitous variation, whereby the creature is enabled to reach higher zones of the foliage of trees than its contemporaries, and by so doing to triumph over them in the struggle for existence. This lengthening of the neck, though the most striking of the changes that must take place, is only one amongst a multitude that are necessary to make it beneficial. In the first place, additional bulk means additional weight, thus throwing strains upon parts that have not previously experienced them, upon the shoulders, upon the vertebræ of the neck and back, the fore-legs, etc., etc., which must be proportionately strengthened, and their attendant muscles with them. Before this can be done, the circulation must be augmented to supply the bones and muscles with blood in larger quantities to keep pace with the increased expenditure. Further, greater calls will be made upon the nerves that stimulate the blood supply, and they will have to be modified in harmony with the new requirements. If now we have the modification of the neck alone,

we lack all the apparatus that make such a variation of service. Without strong muscles, rigid vertebræ, copious blood supply, and powerful nerves, the additional weight is a serious encumbrance, a defect that would inevitably cause its possessor to become a prey at the very first onslaught of its enemies. To suppose that all necessary variations would take place at the same time would be to make rather too large a claim on one's credulity, for although the curious phenomena of the correlation of variation of organs account for the simultaneous variation of related structures, yet variations just suitable in place and amount in organs belonging to osseous, muscular, vascular, and nervous systems, are difficult to credit. We seem to have no alternative, according to Weismann's theory, except to suppose that after a new structure has arisen in one part of the body, the organism has to wait an indefinite number of generations for the other variations necessary to make it of value. The organism would be out of equilibrium in the first place, and if further variations occurred in the same direction as the first, the balance of functions would be more and more disturbed. From the opposite point of view no such difficulties are encountered. If we suppose that after the new structure has made its appearance, the organism is able, by exercise and use, to modify its muscles, &c., to a proper standard of efficiency, and transmit the modifications to its offspring, the species would readily adjust itself to its new conditions, and be ready to receive a fresh instalment of the favourable variation if it chanced to occur.

Weismann explicitly states that if any case can be found which cannot be explained by natural selection acting upon fortuitous variations, his theory must collapse; so it is to the pursuit of such that I recommend all of those interested in biological questions.

The well-known habit of the Cuckoos of placing their eggs in the care of a foster-mother is repeated in the case of the Cow-birds* (*Molothrus*), a genus of birds allied to the starlings, and widely separated from the cuckoos. Is it probable that the innumerable complex variations upon which such a habit must have been built could have been repeated in two genera in no way connected with each other? Had they been related, they might have inherited the instinct from a common ancestor, but they are not.

A similar difficult case occurs amongst the Heterosporous Cryptogams. Sachs says of these: "There existed during previous geological epochs Horsetails with two kinds of

* Geddes and Thompson, "Evolution of Sex."

spores, but the species are now extinct. Nevertheless we have two small families of fern-like plants mutually very distinct, which, in spite of their great difference, are still grouped together under the absurd name of Rhizocarpeæ. These are the Salvineæ and the Marsileæ, in which are formed two kinds of spores entirely different in nature; and the same peculiarity is again met with in the case of the great subdivision of the Vascular Cryptogams, namely the Lycopodiaceæ (*Dichotomeæ*). Here also are two very different families, the Selaginellæ and the Isoeteæ, in which two kinds of spores are produced. I cannot here repress the remark that it harmonises little with Darwin's views when we see repeated in three different classes of the vegetable kingdom, with otherwise similar spores, a phenomenon so important as the production of two kinds of spores, with their consequences. Certainly it cannot be explained by Natural Selection in the struggle for existence."

To those who are familiar with the complicated structure of the macrospores, and their relation to the microspores, this will appeal strongly. It is sufficient for me to say that they are very highly developed structures, almost as much so as the ovules and pollen grains of the Conifers, and stand in the same relation to each other as they do. In this case it is even more difficult to believe that a parallel series of variations occurred leading to identically similar structures in these widely separated plants. It may be argued that it is no more improbable than that carnivores, though but distantly related, are found with similar habits widely distributed over the world, and separated by oceans, but this cannot be called a parallel of these two cases, for in tracing the descent of the cuckoo or of the Heterosporous Cryptogams, those peculiarities that so prominently distinguish them disappear before the point is reached where the two lines converge, which would not be the case with the Carnivora.

The Brine Shrimp (Artemia) is parthenogenetic, or only very occasionally reproduces itself by sexual means; the proportion of males to females being 1-3,000, so that if variation can only occur during a sexual generation the chances of a variation in any one direction are very small; yet the *Artemia Mulhousenii*, which lives in water containing 25 per cent. of salt, can be caused, by diluting the water to 4-5 per cent., to change to *A. salina*; by further diluting to freshness, it changes to a form belonging to a different genus, Branchypus, a much larger creature, with quite different structure both internal and external. Now if the chances of variation are one in three thousand, and the chances of a favourable one

proportionately smaller, how is it possible for the experiment to be repeated with success without allowing for adaptation through the influence of the environment? It would seem infinity to one against it!

The love for man displayed by domestic animals, and the feeling of security they evince when in company with him, are a further instance. Under domestication Natural Selection is suspended, and only those characters that have a commercial value stand any chance of being preserved; and as these (except perhaps in the dog and the cat) are not marketable qualities, it is hard to believe that the same mental condition should have arisen in such various creatures except through the influence of contact with man.

Cases of inherited instinct in pointers and sheep dogs, &c., might also be quoted, but most of them are insufficiently authenticated, and are worthless until more exact observations have been made upon them.

The case of the Bach family, mentioned by Spencer, in the "Principles of Biology," in which the faculty of music was distributed in a high degree over three hundred Bachs, is not admitted by Weismann as supporting the conclusion drawn from it. He argues that if the faculty arose and became intensified by continual practice, the most brilliant member of the family should be amongst the later ones, whereas the great Bach came in the middle of a line of lesser lights.

Cases of hereditary diseases that make their appearance late in life, such as consumption, gout, epilepsy, &c., are at present used as powerful arguments against the theory; but it is by no means certain that these diseases, which prove hereditary, are not the result of a variation in the germ of the person who first exhibits it. These were advanced against the theory in the discussion at Oxford, but at present the data are much too uncertain to justify a condemnation offhand.

The one argument that Weismann admits to be a difficulty, is supplied by the well-known experiments of Brown-Sequard. I will not unnecessarily lengthen the paper by discussing it, but simply state the facts. By means of a lesion of certain nerves, such as the severing of the sciatic nerve, by severing the spinal cord in the lumbar region, by removing portions of the brain, or even by merely puncturing the spinal cord, of guinea-pigs, he produced all the symptoms of epilepsy. This is said to have been transmitted to the offspring. Out of thirty cases, thirteen were perfectly healthy. In the experiments conducted by Obersteiner, out of thirty-two descendants of epileptic parents only two exhibited such

symptoms, both of these being very weakly, and dying at an early age.

An idea occurred to me a few nights ago on being awaked from my slumbers by an asthmatical old rooster. How could the habit of crowing in the middle of the night possibly have arisen by Natural Selection? No conceivable purpose is served, so its development cannot have been aided by man, for it has been an annoyance ever since the time when Peter used bad language about it.

The fault I find with Mr. Poulton's diagram is that it gives one the idea that after the primary division of the ovum the whole of the germ-plasm is retained by one of the halves. He is certainly quite right in showing it so that it corresponds to his statement of the theory and also to Weismann's; but the latter implies in one argument that other cells besides those devoted to reproduction possess some of it.

It had been suggested (by Strasburger) that Begonia leaves, when placed under suitable conditions, could send out roots and shoots from the mid-rib, and produce plans that were capable of propagating in the ordinary way, and he replied that there must have been some germ-plasm in the cells of the mid-rib, or such a thing could not occur. This case, and also the similar one of mosses that can reproduce themselves by any fragment of any portion of the plant, would tend to prove that there must be germ-plasm in every part of the organism. Any part of the living meristem can produce new cells, as is frequently seen in the callus that grows from the edges of wounds in trees, and subsequently covers them. In animals the new flesh that arises under like conditions, the production of a new socket to a limb that has been dislocated and not re-set, and the peculiar power of reproducing a lost limb possessed by reptiles and crustacea, already referred to, are cases in point. In multiaxial plants, as each bud arises from the growing point, there also must the germ-plasm be divided, as it shows itself both in the blossoms produced by such buds and in the growing point, which must retain a portion to pass on to later buds. If, then, these dividing cells may be equally possessed of a quantity of germ-plasm in the case of the throwing off of a bud, and of the germinating Begonia leaf, then I can see no reason why germ-plasm should not be shared by every cell that arises beneath the growing point, no matter whether it goes to form somatic or reproductive tissue.

Notwithstanding the highly hypothetical nature of this theory it is exceedingly attractive, and possesses some excellent qualities. It explains atavism or reversion, it throws light on the phenomenon of the extrusion of the polar

globules, upon parthenogenesis, and upon the origin of the sexes. I have not been able to touch upon these subjects here, but to those who are interested in the subject of heredity I recommend a careful study of Weismann's own work.

Though one cannot say that the theory is final, one cannot help acknowledging that it is more powerful than any other yet put forward. It has already been of the greatest service in bringing new facts to light, and promises to be of still greater benefit in the future.

I commenced the study of the theory with avowed antagonism, but soon found myself in the same predicament as Baalam of old, not that I was riding my hobby too hard, but that, after being called upon to curse the newly found enemy, I was compelled to bless it.

HERBERT STONE.

THE FUNGI OF WARWICKSHIRE.

BY W. B. GROVE, M.A., AND J. E. BAGNALL, A.L.S.

(Continued from page 139.)

Genus II. COPRINUS. *Fr.*

301. **C. comatus**, *Fr.* Sides of roads, &c. Sept.-Oct. The Spring, Kenilworth, *Russell*, *Illustr.* Warwick, *Perceval.* School Close, Rugby; near Bilton, *Rugby Sch. Rep.* The Moats, Ansty, *Adams.* Edgbaston! *Southall.* Sutton; Water Orton; Sheldon; Solihull; &c.

302. **C. ovatus** *Schæff.* Pastures. Sept. Fields, Ansty, *Adams.*

303. **C. sterquilinus**, *Fr.* *Ag. cylindricus*, var. 2, With. Rare. In the Garden Field at Edgbaston, July, *With.*, 281. Withering quotes *Ag. oblectus*, Bolt., t. 142. Old hot-bed, Ansty, *Adams*, July, 1884 = *Cooke*, *Illustr.*, pl. 660.

304. **C. atramentarius**, *Fr.* About old stumps. *Ag. ovatus*, With., Purt. "In my garden" (Alcester), Purt. iii., 426. Abbey Field, and near Kenilworth, *Russell*, *Illustr.* Hopsford, *Adams.* Sutton; Sutton Park; Edgbaston Park (which is doubtless also Withering's locality, p. 287). Trickley Coppice; Rugby; Old Park, near Arrow; Austey Wood; Corley, &c.

305. **C. picaceus**, *Fr.* Roadsides. Rare. Between Alcester and Dunnington, on the side of the turnpike road, Dec. 5, 1820. *Piercy in Purt.* iii., 233.

306. **C. similis**, *B. and Br.* On trunks of dead trees. Rare. Sutton, on logs of timber, found several years in succession.

307. **C. fimetarius**, *DC.* Pastures and roadsides. June to Oct. Ansty, *Adams.* Sutton ; Coleshill Heath.

308. **C. tomentosus**, *Fr.* Amongst grass. Rare. June to Oct. Sutton ; Water Orton. My specimens agreed exactly with Bolton's figure, *t.* 156, and were "not expanded."—W. B. G.

309. **C. niveus**, *Fr.* On horse dung. Common. Sept. to Oct. The Spring, Kenilworth ! *Russell, Illustr.* Ansty, *Adams.* Near Bilton, *Rugby Sch. Rep.* Sutton; Trickley Coppice ; pine wood, Coleshill Heath ; Edgbaston Park ; Packington Park ; Langley ; Berkswell, &c.

310. **C. micaceus**, *Fr.* About old stumps. Common. June to Oct. Warwick, *Perceval.* The Moats and fields, Ansty, *Adams.* Bilton ; School Close, *Rugby Sch. Rep.* Oscott ; Sutton ; Middleton ; Packington Park ; Berkswell ; old stumps, Kenilworth ; Coventry Road, Kenilworth ; Leamington, Erdington, &c., &c.

311. **C. congregatus.** *Bull.* On the ground. Rare. In clusters on the Milking Bank, Edgbaston, in a hollow where an elm had been fallen, 31st Oct. The crops repeated the same season. In a similar situation in the Grove, 14th April, *With.* 275. Probably only a small form of *C. micaceus.*

312. **C. radians**, *Fr.* On plaster walls. Rare. Aug. to Nov. Growing from the crack of a white-washed ceiling in a cottage at Kenilworth, *Russell, Illustr.* Abundant in an unoccupied house, the Crescent, Birmingham, the roof of which had let in rain for many months.

313. **C. deliquescens**, *Fr.* Old stumps. Oct. Warwick, *Perceval.* School Close, *Rugby Sch. Rep.* Grassy glade in High Wood, Combe, *Adams* (?)

314. **C. Hendersonii**, *Berk.* On dung. Sept. On horse dung, in Crackley Wood, Sept., 1861, *Russell, Illustr.*

315. **C. lagopus**, *Fr.* On dung. Sept. Red Lane, Kenilworth, *Russell, Illustr.* Alveston Pastures, beautifully covered with white flocci, but very deliquescent ; on dung in garden, Aston.

316. **C. nycthemerus**, *Fr.* Very rare. Oct. On tan heaps, Kenilworth, *Russell, Illustr.*

317. **C. radiatus**, *Fr.* On dung. July to Oct. School Close, *Rugby Sch. Rep.* Water Orton; Sutton; Dunchurch. Doubtless common, but easily overlooked.
318. **C. domesticus**, *Fr.* In a bed chamber at Broom, growing upon the laths, *Purt.* iii., 232. The Lodge, Ansty, *Adams.*
319. **C. ephemerus**, *Fr.* On dunghills. Sept. Dunn's Pits Lane, Kenilworth, *Russell, Illustr.*
320. **C. plicatilis**, *Fr.* In pastures. Aug. to Oct. Kenilworth, *Russell, List.* Fields, Ansty, *Adams.* Fields, footway from Itchington Holt to the Banbury Road; Trickley Coppice; Sutton; Coleshill; Marston Green, &c.

Genus III. BOLBITIUS. *Fr.*

321. **B. Boltonii**, *Fr.* *Ag. flavidus*, Purt. Uncommon. Sept. Salford, Bidford, Warwickshire, *Purt.* iii., 228. Purton's species may be only a form of *B. fragilis.* On an old rick frame, adjoining Brinklow Lane, *Adams.*
322. **B. fragilis**, *Fr.* *Ag. equestris*, With. On dung. Rather rare. Aug. to Oct. Pastures, Edgbaston Park, *With.*, 286. At Pophills, *Purt.*, iii., 227. Kenilworth, *Russell, List.* Ansty, &c., *Adams.* Sutton; Water Orton; Coleshill Heath.
323. **B. titubans**, *Fr.* *Ag. titubans*, Purt., With. Amongst grass. May to Oct. Packington Park, *With.*, 280. Oversley; Exhall, *Purt.*, ii., 651. The Camp, Kenilworth, *Russell, Illustr.* Roadsides and fields, Ansty, *Adams.* Witton; Oscott; Driffold Lane, Sutton; Trickley Coppice; Four Oaks.
324. **B. apicalis**, *Smith*, Pastures. Rare. Hopsford, *Adams.* School Close, *Rugby Sch. Rep.*
325. **B. tener**, *Berk.* Overslade, *Rugby Sch. Rep.* (?)

Genus IV. CORTINARIUS. *Fr.*

Tribe I.—PHLEGMACIUM.

326. **C. varius**, *Fr.* Woods. Rare. Oct. Crackley Wood, Kenilworth, Oct., 1875, *Russell, Illustr.* Bentley Park, near Atherstone, *Blox.*
327. **C. cyanopus**, *Fr.* Woods. Rare. Sept. Crackley Wood, Kenilworth, *Russell, Illustr.*
328. **C. variicolor**, *Fr.* High Wood, Ansty, *Adams.*
329. **C. anfractus**, *Fr.* Beech Woods. Rare. Oct. Ladies Hill, Kenilworth, amongst trees, *Russell, Illustr.*
330. **C. multiformis**, *Fr.* Woods. Sept. In woods, Kenilworth, *Russell, Illustr.*
331. **C. talus**, *Fr.* Woods. Sept. Combe Ridings, *Adams.*
332. **C. glaucopus**, *Fr.* *Ag. glaucopus*, With. Plantations, Edgbaston, *With.*, 203. In pine wood, near Kenilworth, *Russell, Illustr.*

333. **C. calochrous**, *Fr.* Birmingham Road and Dale House Lane, Kenilworth, *Russell, Illustr.*
334. **C. purpurascens**, *Fr.* Woods. Rare. Oct. Warwick, *Perceval.* Crackley Wood, Kenilworth, 1869, *Russell, Illustr.*
 Var. *subpurpurascens*, Fr. Pastures, Edgbaston, *With.* 201.
335. **C. turbinatus**, *Fr.* Woods. Rare. Oct. Crackley Wood, Kenilworth, 1871, *Russell, Illustr.*
336. **C. orichalceus**, *Batsch. Ag. orichalceus*, With. Sept. Plantations at Edgbaston, *With.*, 200.
337. **C scaurus**, *Fr. Ag. glaucopus*, var. 2, With. Packington Park, *With.*, 203. Given on the authority of English Flora, vol. v., p. 86.

Tribe II.—Myxacium.

338. **C. collinitus**, *Fr. Ag. collinitus*, Purt. Woods. Oct. Oversley Wood, *Purt.* iii., 181. Burton Green Wood; Copse, Birmingham Road, Kenilworth, *Russell, Illustr.* Gum Slade, Sutton Park; Kingswood.
339. **C. mucifluus**, *Fr. Ag. mucosus*, With. On the ground. Oct. Packington Park, *With.*, 196. Withering's description is evidently that of a Myxacium, § Colliniti, and agrees better with this species than with *C. collinitus.* High Wood, Combe, *Adams.*
340. **C. elatior**, *Fr.* Woods. Local. Oct. Crackley Wood, Kenilworth. *Russell, Illustr.* Combe Ridings, *Adams.* Kingsbury Wood; Waters' Wood, Maxstoke; Brown's Wood, Solihull; Sutton Park; Langley; Wappenbury; Grove Park, near Hatton; Gannaway Grove.
341. **C. delibutus**, *Fr.* On the ground, amongst trees. Sept.-Oct. Windley Pool, Sutton Park, 1886-7.
342. **C. stillatitius**, *Fr.* Birmingham Road, Kenilworth, Oct., 1886, *Russell, Illustr.*

(To be continued.)

Reports of Societies.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—July 21st. Mr. P. T. Deakin exhibited a specimen of fossil Echinus in an ironstone pebble, also specimens of *Drosera longifolia;* Mr. Hawkes, the Greater Dodder, *Cuscuta europæa*, from Portland; Mr. J. Collins, a specimen of Saw-wort, *Serratula tinctoria.*—July 28th. Mr. J. Moore exhibited a pair of beetles, *Cychrus rostratus*, and under the microscope gizzard of the same; Mr. A. Camm, ten species of fungi, including *Dictydium cernuum*, *Ceratium hydnoides*, *Cribraria argillacea* and *C. intricata;* Mr. Parker, *Megalotrocha flavicans*, a social rotifer.—Aug. 11th. Mr. J. Madison exhibited a white variety of

black slug, *Arion ater;* specimens of *Limnæa stagnalis* var. *turgida* from Osmondthorpe Park, and *L. glutinosa* from Hull; also a specimen of Frogbit, *Hydrocharis Morsus-ranæ;* Mr. H. Hawkes, a collection of marine algæ, and several specimens of Dodder, showing their mode of attachment to the host plant. Mr. G. H. Corbett gave an interesting account of a visit to the mountain limestone of the Great Orme's Head, and showed a few fossils from that formation. Mr. Linton showed Gorgonias from the West Indies.

DUDLEY AND MIDLAND GEOLOGICAL AND SCIENTIFIC SOCIETY AND FIELD CLUB.—Wye Valley Meeting.—The members of this Society held their third field meeting at Symond's Yat and other places on the Wye on Monday and Tuesday, July 21st and 22nd. The number present was small, on account, probably, of the meeting extending over two days. Arriving at Lydbrook Junction some of the party got out with Mr. Thomas Southall, who had kindly consented to act as botanical guide. These members proceeded above the river along the Coldwell Rocks. On the way they saw part of the celebrated Offa's Dyke, and at various points were able to get truly magnificent views of the different parts of the Coldwell Rocks, which form part of the finest scenery of this well-known Valley. The rest of the members got out at Symonds' Yat, and the two parties joined at the top. Several rare plants were found by botanists, including *Atropa Belladonna.* After descending, boats were taken to the Lady Park Caves, which were explored for upwards of an hour, under the guidance of Mr. Davis, of Rocklea Hotel, Symond's Yat, who has done so much to open up these caves. Several members expressed an opinion that the caves, which are known to have another entrance, were formerly the course of an underground river. It is known that the River Wye, now about 200 feet below the caves, was once flowing above their level. In a cave on the opposite side of the river the late Mr. Symonds made some very interesting explorations, during which he discovered the remains of animals, including the rhinoceros and fossil horse, reindeer, Irish elk, cave lion, hyæna, and mammoth; also flint flakes, proving the presence of man in remote ages. The party continued on by the boats to Monmouth. The next morning the members went to Tintern, where the Abbey was visited; thence to the Wyndcliffe, the view from which was duly admired. Here several members walked (by permission of Mr. Clay) through the grounds of Piercefield Park, the object being to study the geological formation where the dolomitic conglomerate is found. The rest of the party drove through the Park to Chepstow, from whence the party started homeward.—Clent Meeting. Aug. 16. The members of this Society held their fourth field meeting at Clent, on Saturday afternoon, the 16th August. On arriving at Hagley Station carriages took the members to Clent Church, where they were met by Mr. John Amphlett and the Revs. F. R. Lawson and T. D. Thatcher. Mr. John Amphlett pointed out the different parts of the church to be noticed, and recounted many events connected with the parish. The pillars of the south arcades are late Norman or very early English. There are similar capitals in the arcade of Halesowen Church. The chancel roof, which is composed of short lengths of oak cut into shape by axes, is typical Early English of about 1200-50, on debased perpendicular walls. There are traces that this roof has not always been over the chancel, and it is supposed that it once covered the nave. The most remarkable feature in the church is the orientation of the chancel to the south. Several churches have an

orientation of the chancel to the north, but very few to the south. The chancel window and the tower are very late perpendicular (1400). The first church at Clent was erected shortly before 1199. There was at one time a great lawsuit about the tithes and patronage. The parish registers date from 1562. During part of the Commonwealth marriages took place before a magistrate, and many of these are entered, but the register so as to have them entered was taken to places many miles from Clent. In the minute books the erection of a singing gallery is mentioned, but subsequently they did not place there the persons who had the best voices but the persons who first had seats there, who transmitted their rights by descent, and in several cases the right to a seat in the singing gallery was purchased. An amusing incident connected with the parish is mentioned in the same minute book. At the end of the last century the Vicar of Clent incurred the displeasure of his parishioners, who ordered the clerk to give notice of a vestry meeting to take into consideration the conduct of the vicar. Unfortunately for the clerk, who sat in the bottom tier of a three-decker, when the vicar realised what notice the clerk was giving out, he quickly suppressed him by throwing a large cushion on to his head. The members next visited a gravel pit in the Bunter conglomerate, in which some fossils derived from the Llandovery sandstone have quite recently been discovered. The fossils have been identified as Favosites, Strophomena, Linstromia, and the stem of a crinoid. Hence the way was continued up Clatterbach Valley, between Clent and Walton Hills, where several good sections of the brecciated Permian were seen, and on to St. Kenelm's, which has a perpendicular tower richly adorned with pinnacles and gargoyles. There is also a fine tympanum over the west door. The fact was mentioned that on the restoration of this church several frescoes were discovered representing the different events connected with the legend of St. Kenelm, which were destroyed, but not before Mrs. Akroyd took drawings of them. These drawings were published in some paper circulating in or near the district, but it cannot be ascertained which it is. The summit of Clent was the next point, and from here a more extensive view than usual was seen. It included the Berwyns, Longmynd, Clees, Radnor Tump, Black Mountain, Abergavenny Sugar Loaf, Malvern, Cotswolds, Edge Hill, and several other lesser heights. Below could be traced the ground which was once covered with the water forming the Severn Straits and dividing England from Wales, and to the action of which so many geological changes are due. Immediately below is the land formerly comprised in Clent Heath, upon which a fierce battle was fought between the Romans and Britons, in which the latter were defeated, but only in their turn to defeat the Romans (on Rome failing to support them) a few years later in another fierce battle around Clent and Walton. Continuing, the party went through Hagley Park, and arriving at Hagley dispersed to their several destinations.

SEVERN VALLEY NATURALISTS' FIELD CLUB.—July 31. A large number of members of the above Club met at Bewdley, and proceeded to Cleobury Mortimer. Carriages were in waiting, and the party were driven to Craven Place, which is situated on the Cleobury and Ludlow main road, near to the top of the hill, and close to the Dhu stone quarries on Hoar Edge, where most interesting examples have been exposed of curved basaltic columns, similar to those in the Island of Staffa. The first geological feature examined was the great quarry of Dhu stone. Mr. C. J. Cooper, who kindly acted as guide to

the party, pointed out that recent excavations had laid bare a very interesting columnal structure, similar to that which is so well known at Staffa and on the coast of Antrim. Numerous columns were seen in the face of the quarry. Most of them were curved and had five or six sides. Mr. Cooper adopted the theory that the axes of the columns lay at right angles to the surface of cooling, which was the side of the intruded mass in the case of dykes and the surface of the sheet in the case of flows. The Dhu stone was a trap rock (basalt) which had been forced up through an orifice or orifices in the crust, and had overflowed at the surface. The President (Dr. Callaway) concurred in Mr. Cooper's remarks, and added a few observations. Some doubt was felt as to the position of the chimney up which the basalt of the Titterstone Clee had flowed. Sir R. Murchison and the Geological Survey had supposed it to be in the centre of the hill; but Mr. Yates, the acting manager of the works, who was consulted by the members, stated that his experience had not led him to support that view. At the summit, Mr. Cooper gave an address on the geology of the country visible from that point. He commenced with an explanation of the term "Titterstone," which Hartshorne had connected with the word "totter," from a large stone which, in former times, was so nicely balanced that it could be made to oscillate by the pressure of the hand. It was then shown that the structure of the Brown Clee, which rose in front of the party as they faced the north, was similar to that of the hill on which they stood. The cakes of basalt which crowned the summits of the twin elevations were probably the remains of what was once a great sheet extending over the district. Under the basalt lay the coal measures, which, in the Brown Clee, rested on the old red sandstone; but, on the Titterstone, the millstone grit and the carboniferous limestone intervened. Owing to the action of the forces of denudation, the basalt and the underlying carboniferous series had been stripped away from the region, except in the comparatively small patches forming the present elevations. The Clee Hills might therefore be regarded as islands of younger rocks, surrounded on all sides by the old red sandstone. Looking further to the north and west, the eye caught the ridges of old red stone, and, a little beyond, the long straight line of Wenlock Edge, composed of Silurian rocks, was visible. Then came the Ordovician ridges of Chatwall and Frodesley and, just beyond, the archæan masses of Lawley and Caer Caradoc. Further to the north-west stretched the long, rounded elevation of the Longmynd, and behind it the ridge of the Stiperstones, with the Corndon visible beyond. Looking down to the west the party could see the town of Ludlow, surrounded by its picturesque ridges of Silurian rock, and beyond Ludlow stretched a varied region consisting of Silurian and Devonian (old red sandstone) strata. The President, in proposing the thanks of the club to Mr. Cooper, added some remarks on the older rocks of the region in front. He drew attention to the extreme interest attaching to the Longmynd system. It consisted of rocks probably older than the Cambrian; but no definite organic remains had yet been discovered in them. The fossils found in the Cambrian were of by no means the lowest types, and it was to be expected that the Longmynd strata would yield animal remains older than any that had yet been discovered in the world. Patience and hard work were needed to obtain results; but a rich harvest lay before them. At a meeting of the officers of the club, held during the day, it was decided to hold the next winter meeting at Bridgnorth, and, in addition to the presidential address by Dr. Callaway, Mr. C. J. Cooper was asked to read a paper.

THE MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

ANNUAL MEETING AT LEICESTER.

The thirteenth annual gathering of the Union took place at Leicester, on Thursday and Friday, September 18th and 19th, the arrangements being under the control of the Leicester Literary and Philosophical Society. Mr. F. T. Mott is president of the Union, and the secretaries are as follows:— Birmingham, Mr. Lawson Tait, LL.D., F.R.C.S., and Mr. Kineton Parkes; and Leicester, Messrs. C. J. Billson, M.A., W. Simpson, and G. Hull. Thursday's proceedings commenced at one o'clock, when there was a private meeting of the council for the transaction of the preliminary business. At 1.45 the members of the union and their friends met at the Belvoir Street Schoolrooms, and parties were arranged to visit the different objects of antiquarian interest in the town. The members were divided into two groups. One was directed by Mr. W. Jackson, and the second by Mr. A. H. Paget. Starting in opposite directions, they each made a circuit of the places of interest of the town in course of the afternoon. They visited, among other things, the Magazine Gateway, the Trinity Hospital, the Chantry House in the Newark, the Castle Gateway, the Castle, and the Castle Mound, St. Mary's St. Nicholas's, St. Martin's, and St. Margaret's Churches, the Jewry Wall, Roman Pavement, and the Old Town Hall. At 3.30 the members again assembled at the Belvoir Street Schoolrooms, were afternoon tea was served.

The Annual Meeting.

The annual meeting for the transaction of general business was then held, the President (Councillor Mott) occupying the chair.

The Secretary read letters of apology from the following members, Mr. E. B. Poulton, M.A., F.R.S. (Oxford), Rev. R. E. Wanstall (Condover); Mr. T. H. Waller, B.A., B.Sc. (Birmingham); Mr. J. Kenward, F.S.A. (Birmingham); Mr. H. M. J. Underhill (Oxford); Mr. W. B. Grove, M.A., Mr. Jno. Rabone, and Mr. W. H. Wilkinson (Birmingham). Letters were also read from the following societies which were unable to send representatives: Chester Society of Natural Science, Peterborough Natural History, Scientific, and Archæological Society; Croydon Microscopic and Natural History Club, Burton-on-Trent Natural History and Archæological Society, North Staffordshire Naturalists' Field Club, Barnsley Natural History Society, Marlborough College Natural History Society, and the Nottingham Natural History Society.

The President expressed regret that so many societies had been unable to send delegates. Leicester was a central place, and he should have thought that they could have sent some one to represent them. He trusted, however, that those who were in attendance would thoroughly enjoy their visit.

Annual Report.

The annual report of the council stated that the Union now consists of the following societies:—

Birmingham Microscopists' and Naturalists' Union.
Birmingham Natural History and Microscopical Society.
Birmingham Philosophical Society.
Birmingham and Midland Institute Scientific Society.
Birmingham School Natural History Society.
Caradoc Field Club.
Derbyshire Archæological and Natural History Society.
Dudley and Midland Geological and Scientific Society and Field Club.
Leicester Literary and Philosophical Society.
Malvern Field Club.
Oswestry and Welshpool Naturalists' Field Club.
Oxfordshire Natural History Society and Field Club.
Rugby School Natural History Society.
Severn Valley Naturalists' Field Club, and
Tamworth Natural History, Geological, and Antiquarian Society.

The report went on to state that the council regretted to say they did not feel justified in appointing adjudicators for the Darwin medal this year. The subject this year was Zoology, but the papers on the subject contributed to the *Midland Naturalist* were of so slight a nature, and so few in number, as to warrant the holding over of the medal, The subject for next year would be Archæology. The publication of the *Midland Naturalist* had proceeded with regularity, and the contributions were well up to the average. The volume for the last twelve months included some important contributions, among which may be mentioned W. Mathews's continuation of the "County Botany of Worcester," the continuation of W. B. Grove's and J. E. Bagnall's "Fungi of Warwickshire," and serial articles on "Theories of Heredity," by E. B. Poulton, M.A., F.R.S., P. Chalmers Mitchell and Herbert Stone, F.L.S. "On the Origin of Decorative Art," by Henry Balfour, M.A., F.Z.S., and by the same author on "The Fin Whale Fishery in North Lapland." On "Constance C. W. Naden," by W. R. Hughes, F.L.S., W. A. Tilden, DSc., F.R.S., and R. Lewins, M.D., and a poem on the death of Miss Naden, by J. A. Langford, LL.D. Other articles are "The Land and Fresh-water Mollusca of North Staffordshire," by J. R. B. Masefield, M.A.; "Notes in North Devon," by O. V. Aplin; "On the Quaternary Deposits of Shropshire," by Ch. Callaway, D.Sc., M.A.; "On

the Motion of the Cilia of Animalcula," by G. J. Burch, B.A.; "The Flight of Birds and Insects," by E. Catchpool, B.Sc.; "The Principles of Sociology," by the late C. C. W. Naden; "The London Meetings of the International Geological Congress," by the Rev. G. Deane, D.Sc., B.A., F.G.S.; on a "Proposed Photographic Survey of Warwickshire," by W. J. Harrison, F.G.S.; "On the Flora of Spain," by G. C. Druce, M.A., F.L.S.; "The Dover Coalfield and its Connections," by Rev. J. M. Mello, M.A., F.G.S.; and a series of papers by T. H. Waller, B.A., B.Sc., including "Petrology of our Local Pebbles," "Notes on some Norway Rock Specimens," and "The Process of Crystallization in Rocks." The publications of other societies in the Union to be noticed are:—The Transactions of the Leicester Literary and Philosophical Society—Section A (Archæology, Literature, and Economics), which include "Characters and Character Drawing," by A. Percival Moore, B.A.; "A Note on Romola," by C. J. Billson, M.A.; "Shakespeare's Jesters," by W. Simpson; "An Account of Ashby Castle," by Leonard Fosbrooke. Section D (Biology), "The Native Bulbs of Leicestershire," and "On the Development of Museums," by F. T. Mott, F.R.G.S.; "Spiders," by the Rev. W. Agar. Section E (Zoology), "The Pterylography of Birds' Wings," by W. P. Pycraft; "Notes on the Great Salina," by the Rev. A. L. Sparkes. The President's Address, by J. D. Paul, F.G.S. The Report of the Severn Valley Naturalists' Field Club for 1888-9, which indicates a considerable amount of very useful work. The Council regret to state that the Northamptonshire Natural History Society and Field Club is no longer a member of the Union. The Derbyshire Archæological and Natural History Society has joined the Union during the past year.

Ald. Stevenson, in moving the adoption of the report, said that it did not present many features on which he could hope to dwell with any profit to the present audience; but he would confine himself to expressing the sincere gratification of the members of the Literary and Philosophical Society at receiving another visit from the Midland Union of Natural History Societies.

Mr. Pumphrey seconded the resolution. He regretted that the report did not give them any intimation of work which he thought might be done, and for which he thought that association was especially formed, to render assistance to societies by means of papers and lectures. He believed that was an object highly deserving of the attention of the various societies, and one by which they might receive great benefit.

The report was then carried.

FINANCIAL.

The treasurer's annual report showed a balance in hand of £11 15s. 6d.

Dr. Deane moved the adoption of the report, and, in doing so, said they might congratulate themselves this year upon being in a satisfactory condition financially. It was earnestly to be hoped that the archæologists of the different societies would send in contributions to the *Midland Naturalist* to compete for the Darwin medal in the forthcoming year. Mr. Harvey seconded the motion, which was agreed to.

VOTES OF THANKS.

The President moved that a hearty vote of thanks be presented to the retiring officers of the Union for their very efficient services during the past year. He believed the annual meeting held last year at Oxford was a very effective and exceedingly interesting one in all respects. and that its success was due in a large measure to the efforts of the then President, Mr. Poulton. They were also greatly indebted to Mr. De Hamel, the treasurer, and the two hon. secretaries, Dr. Lawson Tait and Mr. Kineton Parkes, the latter of whom they were extremely pleased to welcome to Leicester on that occasion. Mr. Billson seconded the proposition, and it was adopted.

ELECTION OF OFFICERS.

On the motion of Mr. Herbert Stone, seconded by Mr. Knowles, the treasurer and hon. secretaries were unanimously re-elected for the ensuing year.

THE PRESIDENT'S ADDRESS.

Mr. Mott, the President, delivered an address on "Organic Death," which will be printed in full in a subsequent number. The address was followed by some interesting remarks by Mr. Packe, Mr. Herbert Stone, and Mr. A. T. V. Turner; after which Mr. Mott replied to the points raised in the discussion on his address.

The Rev. O. M. Feilden moved a vote of thanks to the President for his address. Mr. De Hamel in seconding the resolution, said the visiting members of the Union were deeply indebted to Mr. Mott and his colleagues for the very excellent arrangements made for their gratification that day. One of the great advantages of the Midland Union of Naturalists was that they were brought together in this way, and that many of them who had previously only been acquainted with one another in the way of correspondence became personally known to each other.

The proposition having been unanimously agreed to, the President briefly replied, and the meeting terminated.

CONVERSAZIONE.

In the evening a conversazione was held under the auspices of the Leicester Literary and Philosophical Society at the Museum. The attendance was very large, and in every respect the evening proved a most interesting and enjoyable one. The whole of the Museum buildings and School of Art were used for the purposes of the conversazione, The lecture hall was utilised as a reception room, and also for the purpose of exhibiting numerous objects of interest, artistic and scientific. The pictures on the walls belonging to the Leicester Art Gallery found hosts of admirers; while others evinced no little interest in the collection of neolithic remains from the Elbolton Cave, near Skipton; the very fine display of Brazilian insects, fruits, potato products, &c., lent by the Rev. T. A. Preston; the delicate designs in dried flowers, by Mr. E. F. Cooper; products of coal tar, prepared by Mr. Colson, manager of the Leicester Gas works; type writers, automatic fire alarms, and various kinds of optical apparatus. On the platform tables were a number of powerful microscopes, by means of which living animalculæ, freshwater algæ, &c., were exhibited. Other attractions were several cases containing unique examples of pottery, metal work, &c., from South Kensington. One of the most interesting items of the evening's programme consisted of recitations given by one of Edison's newest phonographs, which proved an unlimited source of entertainment and amusement. In the Museum the fine collection of vertebrates, the Bickley collection of British birds, the great fossil Saurians from the Barrow lias, the British and Roman antiquities, and the collection of Charnwood rocks all found their share of interested patrons. A number of charming selections of music were rendered by Mr. J. Addison Adcock's string band. During the evening refreshments were provided in a tent opening from the annexe.

Among those present, either at the conversazione or at the afternoon meeting, were the Mayor of Leicester (Alderman Lankester), Mrs. Lankester, Miss Lankester, Messrs. F. J., E. A., and C. Lankester, and the Misses Butler (Leeds), Mr. J. Ellis, M.P., Mrs. Ellis, Miss Ellis, Mr. Herbert Ellis, Rev. Dr. Deane (Birmingham), the Rev. O. M. Feilden (Oswestry), the Rev. P. T. Forsyth, the Rev. T. A. Preston and the Misses Preston, the Rev. E. Jones, (Embsay, Yorks), Councillor F. T. Mott (President of the Union) and Mrs. Mott, Mr. W. R. Hughes, F.L.S. (Birmingham), president of the Sociological Society, Mr. and Mrs.

Charles Packe (Stretton Hall), Mr. Packe, jun., Alderman and Mrs. Kempson, Alderman and Mrs. Stevenson, Alderman Barfoot and Mrs. Marlow (Southport), Alderman and Mrs. Hart, Mr. and Mrs. Fielding Johnson, Mr. A. H. Paget and Miss Paget, Mr. Egbert de Hamel (Middleton Hall, Tamworth), Mr. H. Stone, F.L.S., Mr. C. Pumphrey (Birmingham), Mr. and Mrs. Kineton Parkes, Miss Jermyn, Mr. J. Buncher, Mr. W. Edmonds, Mr. J. Gardiner (Birmingham), Mr. J. Wilson (Malvern), Mr. G. Stubbs (Sutton Coldfield), Mr. Hugh Atkins (Hinckley), Mr. and Mrs. E. F. Cooper, Dr. and Mrs. Tomkins, Mr. and Mrs. C. J. Billson, Mrs. Islip, Mr. and Mrs. R. Harvey, Mr. and Mrs. Harper, Mr. and Mrs. C. A. Spencer, Mr. and Mrs. W. Evans and Miss Evans, Mr. H. W. Plant and the Misses Plant, Mr. and Mrs. C. Robinson, Messrs. W. Simpson, G. Hull, A. Baines, W. A. Vice, Oldershaw, A. T. Draper, W. Aysom, A. Adderly, Clarke, Roper, T. Carter, Franklin Cooper, jun., F. W. Wartnaby, Mr. A. T. V. Turner, and others.

Two short but interesting addresses were given in the course of the evening, The first was by the Rev. E. Jones, the subject being "Discovery of the Remains of Neolithic Man in the Elbolton Cave." Mr. Jones said that the cave was in the West Riding of Yorkshire, about ten miles north of Skipton, near which placed he lived. In connection with their scientific association they had been exploring the cave, the entrance to which was about a hundred feet from the summit of a limestone hill. This entrance—the only one at present discovered—was steep and pit-like, and was about twenty feet long. The cave itself was not a very large one, the chamber measuring some forty feet in length and from six feet to seventeen feet in width. Very soon after commencing their explorations they came across human remains amongst a number of angular stones which had fallen from the roof. The systematic exploration of the cave commenced in August last year, and they were rewarded by finding among other bones three human skeletons, more or less complete, of men who had evidently been buried in the cave. He produced one of the skulls, which belonged assuredly to the long-headed type of the Neolithic man. The men of the Neolithic age had learned the art, which was unknown to those of the Palæolithic age, of making pots, and the skull he produced was pronounced to be a very fair specimen of the Neolithic man. They had not discovered in the cave any stone implements, but they had come across bone needles, which might have been used for the pinning together of the skin garments or for the

ornamentation of the pottery. One of the buried men—who were discovered in exactly the same position as that in which they had been interred—was found in a sitting posture, with his knees close to his chin—a form of burial characteristic of the age, and the others were in stooping positions of a similar kind. Around the skeleton to which he particularly alluded a sort of fender of stones had been constructed to protect the body. Another skull which they found was very thick. It belonged to a young man, whose teeth were in excellent preservation, but worn down, showing that they had done hard work. Probably he was a handsome young man, a "masher" of his day—perhaps that was why he had a thick skull. Some of the skulls, however, were quite thin. There was evidence that the cave had been used as a dwelling-place by the pre-historic men, in addition to being a burial place. There were remains of charcoal, showing there had been fires, and the bones of animals that had been eaten. The latter were similar to those found elsewhere among the remains of the Neolithic age. There were bones of the small cattle, like those now existing in Scotland, and also of the horse, of which the Neolithic men were very fond. Most of the animal bones had been split, for the marrow in them was considered a delicacy. Remains of pots were also discovered, and the pottery proved to be very rudely fashioned out of the clay that was in the cave. These relics had a great interest for him because he considered that the advance from the simple clay to the rude pots was a step of genius greater than that from the rude pots to the present-day artistic ware. They had carried their explorations below the flooring of the cave as they found it, and they had come across a layer of clay containing the bones of wild animals. Among them were those of the brown bear, the grisly bear—now extinct in Europe—and the Alpine hare. From the number of the bones of young bears he should think the cave must have been once a bear-den, and it was probable that there used to be a larger entrance to it lower down the hill.

The second address was given by Mr. Egbert De Hamel, of Tamworth, the subject being "Beavers." It was most interesting, but unfortunately space is not available for an account of it in the present number.

The Conversazione terminated about eleven o'clock.

Friday was devoted to excursions, of which an account will be given in the November number.

PAINTING LANTERN SLIDES DIRECT FROM THE MICROSCOPE.*

BY H. M. J. UNDERHILL.

Although photo-micrography is very popular as a means of transferring pictures of microscopic objects to lantern slides, painting is in many respects greatly superior to it. In the first place a well-painted slide looks much better on the screen than a photograph, because it is so much brighter, and because it is coloured. Secondly, objects of any thickness cannot be properly photographed, because you cannot get every part in focus at once; and they are very readily drawn. And thirdly, a photo-micrograph takes everything in the field of view, and gives microscopic vision. The microscopist does not notice this, but the layman, whose eyes are not educated to see through a microscope, fails to understand the picture. In a painting you draw just what parts you like, and you translate it from microscopic to ordinary vision. So to those who can draw I say, paint your slides rather than photograph them. It does not take a longer time—reckoning the many failures which our photographic friends seem to make—and you never have to apologise for a slide, as they so often do, saying, "This is a very good slide, you know, but——."

The method of painting that I am going to describe is not new. The beginning of it was described by Dr. Dallinger in the "Microscopical Journal" of some years ago. I did not know this until the other day, for I was taught it by a friend, who learned it from his friend, who, I believe, learned it in Paris. It is just as easy and no more difficult than painting on paper, but having now practised the process for three years and a half I have learnt a few "wrinkles" which I propose to relate.

The first thing is the glass to paint on. This is ground glass, similar to that of which the focussing glasses of photographic cameras are made. It is called "smoothed." I once ordered it as "the finest ground" glass, and got some very coarse stuff. In "smoothed" the grinding is so fine that the grain is hardly perceptible. This takes the paint beautifully, and much better than common glass varnished. Then you need transparent glass to cover your pictures when finished. This costs about 3s. 6d. a gross, and the smoothed crown is about 9s. a gross. Of course I buy it ready cut in 3¼in. squares. The best sort is thin "patent plate; "best crown" is not good enough.

*Read before the Birmingham Natural History and Microscopical Society, March 4th, 1890.

The second thing is the tools to use. For pencils you must have the hardest possible best drawing pencil. I use two sorts, 4H and 6H. For brushes I use quite small yellow sable water colour brushes, taking care that they come to a very fine point. Common brushes are of no use whatever. The paints are ordinary moist water colours, but only the transparent kinds, a list of which, with notes, I give below.

My method of procedure is as follows:—I have a small piece of glass ruled in fine squares, which slips into the eye-piece of the microscope. There are sixteen squares across the field of view. Any optician will make this for 3s. or 4s. Consequently I see the field of view divided into squares. I then rule a piece of card with a space $3\frac{1}{4}$ inch square with small squares $\frac{3}{16}$ inch across. This also has sixteen squares across it. If I lay a piece of ground glass on this, a little frame being fixed to the card to keep the glass in place, I can see the squares through it, and can copy from my microscope with the greatest facility, even with high powers, and with complete accuracy. This "drawing instrument" is far superior to any on the camera lucida plan. I have tried three or four—Nachet's, Zeiss's, and others, and I detest them all: they are clumsy, expensive, and inefficient.

With my 4H pencil I make a very light outline. This is very important, as a good outline always is in painting. Here Dr. Dallinger recommends you to "shade" your drawing with a pencil, and, if you like, cover it with washes of colour. No one can invent a good thing all at once, and this is a good beginning, but the result is much inferior to a properly painted slide. No! Paint up your slide as if it were a picture on paper, and you will be very pleased to find how pleasantly your paints work on the ground glass. After the 4H pencil, I go over the outline with the 6H, and make it clear and firm. Before touching the slide with colour pour a little benzine over it, and rub it with the finger. This lightens the pencil marks without rubbing them quite out, and removes all traces of grease from finger marks. If it be not used the outlines will show on the finished slide, and make it look dirty. Ruskin's direction for painting in water colours is to *finish* as you go on; never go over and over your picture as unskilled people do. You cannot lay one wash over another in painting on glass, for a second wash disturbs the first. I generally settle on what I consider to be the medium tint or tints. I wash the picture over with these, and then paint on the details after-

wards, finishing as I go on. It is not difficult to get washes of colour perfectly even, if, after they are dry, you breathe on them, and "dab" them all over with a soft brush.

You cannot put in the details first and a wash of colour over them, because this would smear everything, and the great secret of painting in water colours on ground glass is to use as little water with your colours as possible. When I began I worked my colours too wet, and the slides I paint now are much better than my first. The high lights can be picked out with a moistened brush, and anything you want to alter can easily be washed completely out with a brush, without disturbing the rest of the drawing. It is difficult to do this on paper, but it is quite easy on glass. I may remark that fine lines need a brush with a very perfect point, so I keep at least two in use—one for general work, and a newer one with uninjured point for the fine parts.

At this stage a few notes on the colours will be useful.

Lamp-black.—A good colour, transparent when put on thinly. It works well, and will make very fine lines. That in tubes is best.

Payne's Gray or Neutral Tint.—Invaluable. It is transparent, makes fine lines, and is good for dark backgrounds. It should be used from a tube.

Prussian Blue.—Very good, but it will not do for dark backgrounds.

Sepia.—Transparent, a very nice colour, but it is difficult to make fine lines with it because it is so gummy. It will do for dark backgrounds.

Burnt Sienna.—Very useful.

Raw Sienna.—This looks on the slide as if it were very transparent, but on the screen it is found to be more or less opaque. If used at all it must be put on very thinly.

Crimson Lake.—No other crimson does so well. I hope it will not fade as it does on paper.

Chinese Orange.—Very nice but useless, because it fades quickly.

Scarlet.—Alas, there is none! Crimson lake and burnt sienna do pretty well.

Greens.—I know of no good ones. Most greens are either opaque, or, if transparent, when they are varnished all the yellow washes out, leaving the slide blue.

Yellow.—Gamboge is good, but the varnish washes it out unless it is mixed with gum. Indian yellow fades, and so is useless.

When looking through the microscope, the uninitiated always like "dark-field illumination," and they like it in

magic lantern slides. Such slides are more trouble than transparent ones, but they are very effective. I have seen some done by varnishing ordinary smooth glass with a resinous black varnish and scratching out the design. These do not look so well as mine. With a tube of Payne's gray I squeeze out a little of the colour on one of my ground glass slides, and by means of a brush I spread it evenly all over the slide *without using any water*—the moisture of the colour is sufficient. This gives me a perfectly opaque slide. I then either let it dry gradually, or else dry it with heat and leave it for a few hours. It then "works" beautifully. I have different sized needles, from the finest possible, to a stout one. These are stuck in wooden handles. I also use the end of a wooden brush handle sharpened to a fine point. With these, and a knife, I scratch out my design. Then I paint it in the ordinary way, and finally finish with a fine needle. You cannot scratch off all the colour from the glass, and in this lies the excellence of my method. It makes a beautiful "half-tone" of light, and the high lights are fetched up with a damp brush which removes *all* the colour. And so on the screen the pictures appear almost to glitter. It is because of this that I use gray instead of black for my background, because gray is pleasanter and more silvery than black for half-tones. Sepia gives a very nice fawn colour. Prussian blue will not do at all, because it chips in the scratching process, and the lines are ragged. If you work on a very dry day the lines will be rather ragged with any colour, but the paint may be moistened by breathing on it. If you use water in spreading the colour you cannot get an opaque slide with one coat of colour; and, if you varnish and put on a second coat, not only is this more trouble, but, when you scratch out the picture, the lines will be a little ragged. These dark-field slides are a considerable trouble to make, but they well repay one by being so effective. This was my first method. I prefer now not to make the backgrounds quite opaque, and I keep them moist for working on by breathing on the slide.

Varnishing.—The painted slides as I have hitherto described them would not show in the lantern, because they are only semi-transparent; they need varnishing. Varnishing is by no means so easy as you might suppose, and I made more than 150 slides before I found out the right way. The friend who told me of the method of making the slides, always varnishes his slides with a brush, and *he only varnishes what the colour has actually covered.* Thus he gets a transparent picture with a semi-opaque background. Such pictures do not

look very well, and the method is *only* to be recommended if your designs have a simple outline. All my pictures have intricate outlines; it is impossible to keep the varnish within these, and so I varnish the slide all over. But in varnishing the slide all over, the use of the brush is impossible, because the brush marks show. You must pour the varnish on, as photographers varnish negatives. But I do not like spirit varnishes. I prefer a resinous varnish, and after trying several sorts I have fixed on Windsor and Newton's mastic picture varnish. It is dear, but a 1s. 6d. bottle goes a long way. It is just of the right consistency, and it is perfectly clear. When the slide is finished I warm it thoroughly in order to dry the paint completely, because water colours get slack and absorb moisture, and so prevent the varnish drying properly. Then with a stiff brush I carefully remove every speck of dust from the surface of the slide; now I pour on the varnish and drain it off. I do *not* slant the slide backwards and forwards as is generally recommended, because this makes the varnish dry with waves in it, which show on the screen, but I lean the slide against something until it is dry. It is then finished all but covering. You must be careful to keep the cover glass from touching the varnished surface of the slide, or it will adhere, and so a little piece of card, about as thick as a post card, must be put at each corner of the slide, in addition to a suitable "mask," to keep the two glasses apart. My binding papers I generally make very broad, and cut out afterwards all that overlaps the picture. Then they do not annoy one by coming off so much.

As this method of painting slides is equally applicable to views and figures, I may give one or two hints about these, too. Provided your artistic skill is equal to the demand on it, slides made in this way look better than the ordinary coloured photograph for the reasons before explained. Figures without backgrounds, just as one paints scientific diagrams, look very well. The faces are hard to do; for these I use rose-madder mixed with *burnt sienna* for the flesh tint, and put in the details with crimson lake and sepia or black. Faces must be worked over a good deal to get the shading right; and to do this the paint can be kept moist by breathing on it. The high lights of the hair can be picked out with a needle point. Landscapes with trees require care, because of the green paint, which does not always look the same on the screen as when you see it on the slide. Blue skies, with light fleecy clouds, can be readily made—if you understand painting skies—in the following way:—After your outline is finished, paint over all the sky with Prussian blue. Lay it

on very thick, but do not pass over the outline. Dry this, and when it is quite dry pour water over the slide, or move the slide up and down in a basin of clean water. All the blue will come off, leaving a light stain, which is just sky colour. The clouds can be picked out of this with a brush as the slide slowly dries. You will then have a sky without a brush mark. Cloudy skies, such as a sunset, require more care, and you cannot do them this way. No colour that I know of, except Prussian blue, will act so, and not every sample of Prussian blue. But this, I have since found, is not so good a way as painting the sky the right tint, and then softening it by breathing on it and using a soft brush. Slides of this kind are varnished in the same way as the scientific slides, but if on trying them on the screen you find any parts that need to be darkened you can paint over the slide (when the varnish is dry) where it needs it, and it is better not to varnish it again. I have tried this re-enforcing business with oil paint. It is not at all a success, and water colours are far better than oils for painting lantern slides, because you can make much finer lines. My friends, when they see my slides on the screen for the first time, always say, "I shouldn't have thought it possible to paint as finely as that, the working hardly looks coarse at all." Nor does it. At the distance of a few feet you do not observe that the picture is not as highly finished as it would be if painted the size of the image on the screen.

Figures and landscapes may be copied, if small enough, by placing the ground glass over the picture and so tracing the outline. But, unfortunately, this is seldom the case. So I have my piece of card ruled with $\frac{3}{16}$ squares, on which is also a circle three inches across. I then have four or five pieces of tracing paper of *different* sizes, but all ruled with the *same number* of squares as my card, and also similarly inscribed with circles. Finding by experiment the right sized piece of paper, it is not difficult to copy the picture on a reduced scale, by means of the guidance afforded by the small squares, which of course are rather larger in the large circle than in the small one. The tracing paper is laid on the picture, and kept flat by a piece of glass. The painting is the same as in the case of scientific diagrams. I have now painted nearly 300 of these slides of pictures, and they are highly popular with children—of all ages. My friends frequently say, "When you are going to show your slides again to some children I wish you would ask me." Of course it is of no use to try, if you cannot draw, but, if you can, you will be very pleased with the result.

THE DOVER COALFIELD AND ITS CONNECTIONS.

BY THE REV. J. M. MELLO, M.A., F.G.S., ETC.

(Concluded from page 174.)

The central and uppermost part of the Mons basin being clearly defined, we might picture to ourselves the underlying strata as lying in regularly deposited beds, the outcrops of which would form zones parallel to the original shore lines to the north and south, but subsequent lateral pressure has much disturbed this arrangement, even if it ever existed. The beds have been upheaved, so that the beds on the north dip towards the south, whilst those on the south dip north, and the whole area is consequently basin-shaped, but the disturbance produced by lateral thrust is very great, and the beds have been distorted. The southern portion of the area is sharply uptilted, and the greatness of the disturbance is shown by the numerous folds; beds which were once nearly horizontal having been compelled to adapt themselves to a restricted space. On the border of this southern area the pressure has actually produced inversion of the beds. Thus, at Mons, where about eighty beds are workable, it is said that "a single seam may be passed through six times in one single pit 1,050ft. deep, and the strata which, if horizontal, would be nine miles broad, are squeezed into an area only seven miles across." In another boring the same seam has been pierced ten times in succession. The inversion of the beds in one case has been so complete that, after passing through Tertiary and Cretaceous strata, 78m. of Silurian and then 84m. of Devonian and Carboniferous rocks have been found.

At Charleroi the compression of the coal measures is remarkable, a breadth of 8½ miles of flat strata having been narrowed to less than half that distance, and no fewer than twenty-two principal folds have been produced here. The upper seams are absent, and the number of coal seams becomes less towards Namur, where the lowest only are present.

As we have seen, the coal measures which, from Liège to Mons, are for the most part exposed, dip beneath the cretaceous rocks as they approach France. and overlie a concealed area of Carboniferous Limestone, which, it is said, appears to rise beneath them as a sort of protuberance, yet one hardly to be attributed to upheaval, as the underlying beds do not break through the coal measures. Had upheaval here taken place, there would have been fractures and disturbances owing to this cause, of which there are now no visible traces. The

coal measures seem to surround the limestone pretty regularly, almost as though it had stood up whilst they were being formed as a pre-existent cape or promontory. Having crossed the Belgian areas of Beaudour, Hautrages, and Pommerœul, where the coal measures lie at too great a depth to be workable, we follow them into France to the west.

The question now arises, Do the well-known beds found to the south correspond with the, comparatively speaking, lesser known ones of the north? If they do, then the lower beds have completely changed their character; at Sirault and Bernissart they are anthracitic, and the northern outcrops are much more anthracitic than those found on the south. The true anthracites, which are found near the northern boundary of the Charleroi area, are not found on the southern boundary, where the last workable coals are bituminous and cannel. In France, at Hergnies, Fresnes, and Vicoigne the coals, again, are true anthracites, which are nowhere found on the south boundary. The fact is, however, it is said, that we do not as yet know enough about the causes which have determined the various qualities of coal—we can but ascribe them to metamorphism, which by a gradual process of condensation has, as we have observed, produced a succession from cannel through bituminous coal to anthracite; but when we find, as we seem to do in the area in question, a single bed of coal changing its character, in the course of a short distance, from bituminous to anthracite coal, we are in the presence of a fact which is by no means easy to explain.

In the area extending from Valenciennes to Douai the coal measures lie in three divisions, the anthracites being, as elsewhere, at the bottom, at Vieux Condé, Hergnies, Fresnes, and Vicoigne; the coal is semi-bituminous at Anzin, and bituminous at Denain, Lourches, and to the south of Aniche. The anthracites are found to occupy a large area on the whole of the northern boundary of the basin. From the axis of the area to the northern limit all the known coals are anthracitic. The passage is progressive from true anthracites, which form the lowest and oldest beds, up through coals which become more and more gaseous in character. The bituminous coals are found on the southern side of the basin, and there is no outcrop of the anthracites. This anomaly has been explained by the presence of a fault which runs parallel to the long axis of the valley from S. Saulve and Anzin to Denain and Abscon, which cuts the basin into two portions, the northern, as we have seen, containing the anthracites and allied coals, and the southern the bituminous coals.

M. Dormoy supposed that an upheaval of the strata broke the coal basin in two, following its longer axis, and raised one

of its sides, causing a lofty escarpment, which has been since removed by denudation; but such an escarpment would, it has been observed by M. Burat, have formed a regular mountain chain of at least 1,000m. in height, which we are to suppose to have disappeared, and its site since then to have been covered by cretaceous beds. M. Burat suggests a simpler explanation, viz., that the displacement of the axis, causing more recent deposits to overlap the edges of others previously thrown down, is sufficient to explain the arrangement of the coals, and he says that such a displacement has been proved to exist in other basins, such, e.g., as that of the Loire. Apart from this, the fault on which the denudation hypothesis rests, is not found at Mons, where the bituminous coals are found on the southern border of the area, as at Valenciennes.

That part of the coal measures which lies between Quiévrain and the Douai district forms a special basin, to which the name "Bassin du Nord" is given, in which both the sequence and character of the coal seams are pretty regular. Along the northern boundary we find unproductive grits and sandstones, followed by anthracites, having a dip of about 30° to south, and the beds succeed each other as they crop out in passing from the north limit towards the axis of the basin. These coals follow the edge of the basin, and can be traced from France into Belgium, where they are worked at Beaudour, Sirault, and Bernissart, and also at Fresnes and Vieux Condé. More to the west, they are found at Hasson and Marchiennes, and probably extend into the northern part of the Aniche area. At Vicoigne as many as fifteen principal seams are present over an area of 1,300m., and the united thicknesses of which are 9·75m.

Along the central axis of this northern basin are found the series of coals called by the French geologist "demi-grasses," twenty-four distinct seams of which are worked at Thiers, Chauffour, S. Louis, Réussite, Casimir Perrier, and Haveluy. Beyond Anzin and Denain these coals are got at Aniche, and beyond that place at Escarpelle. From Thiers to Casimir Perrier, a length of 30k., this series of coal seams is cut off by the fault previously mentioned, and which is known as the "Faille au pli," or "Cran de retour," to the south of which, as we have seen, the coals are bituminous; this fault dividing the bituminous coals from the anthracites on the north of it, and bringing the anthracites, which lie in regular beds, against the bent and folded seams of the southern area. As Aniche is approached this fault is lost.

We may pass on now towards the north-west, and come again to the coalfield of the Pas de Calais, which forms the Continental extremity of the northern coal basin.

As long ago as 1840 attempts had been made in order to find the continuation of the coal measures beyond Douai, but the search was carried on too much to the west, towards Aires, and only resulted in establishing the fact that in that direction the coal was absent, Devonian rocks having been reached beneath the chalk and greensand. In the following year, in a boring for an artesian well at Oignies, shales, which appeared to resemble those of the coal measures, were struck, and in consequence the search for water was given up in favour of that for coal, and the result was that at a depth of about 1,400m. coal seams were actually pierced. Other exploratory borings at Nœux (1845), as well as at other places, led to the sinking of pits, the first being made at Escarpelle, near Douai, and by 1855 the extent of the coalfield was pretty well ascertained. The workable beds of coal vary from 0.50m. to 1.50m. At Lens there is a seam 2.20m. in thickness, and the average depth of the workings in this district is from 150m, to 250m., reaching to as much as 500m. at Ferfay.

Previous to the discovery of the Pas de Calais coalfield the coal measures had been worked in the Boulonnais, at Hardinghen, in an upheaved portion of Carboniferous Limestone, and coal measures, underneath Cretaceous and Jurassic beds. Comparatively unimportant from an economical point of view, this small area is very interesting to the geologist, and indirectly to others, since it serves to show the lie of the beds, which are here considerably inverted. The sections of the Boulonnais coalfield show that the fragment of the Carboniferous beds which are here brought to light has been isolated by two faults parallel to its direction, and about 1,500m. apart, and it is doubtless a fragment detached from a larger mass which lies at a greater depth below the surface. It may even be connected with the Pas de Calais coalfield, as it is on the general line of the beds which run between Douai and Bethune.

We are now in a position to follow these Continental measures across the Channel, and to judge of the line which they should take. The great ridge of Artois to the north of the Ardennes sinks gradually beneath newer deposits, and does not appear to have been so much disturbed there as in the exposed portion in the Ardennes. It can be traced at Brussels, where Silurian rocks appear at a depth of from 63m. to 122m., at Denderleew 151m., at Ninove and Grammont Palæozoic rocks occur at 56m. and 46.75m. below the surface. Devonian beds are met with at Menin at 156.5m., Silurian at Flobecq at 57m. Again, at Tournai we find the Carboniferous Limestone 151m. deep, and finally Silurian strata at Ostend at

a depth of 310m. Reducing these to section, according to scale, a gradual sinking of the beds is shown as they recede from the Ardennes, and it is also proved that no coal is found to the north of the known coal basins. The same facts are also proved in regard to the Liège coalfield. The writer of an article in the *Builder*, to whom I am indebted for some of the facts I have recorded, observes that "the evidence is clear as to the connection which exists between the Palæozoic rocks of the Ardennes axis and those of the Somerset and South Wales areas," and he appears to think that the deterioration of the Carboniferous rocks to the north of the Valenciennes coalfield, and the appearance of Devonian strata both to the north and to the south of the narrow zone to which they are reduced, do not hold out much hope of the existence of any large area of workable coal measures on this side of the Channel in the south-eastern counties, although of course there is "the possibility of isolated portions of the old coal-field being preserved in folds of the disturbed Palæozoic rocks, whose presence has been proved," as we have seen, in the eastern counties and near London.

The line of strike of the Carboniferous beds in the Boulonnais would suggest, he says, that "if the coal measures of that area are continued under the Channel, their greatest development would be found to the westward of the sinking that has been made near Dover. Such a sinking might be undertaken about ten miles to the south-west of that place." The section obtained at Dover, close to the Channel Tunnel heading, is made up of the following rocks :—

Chalk Lower Grey Marl Glauconitic Marl Gault Lower Greensand	500ft.
Portland Kimmeridge Corallian Oxford Clay Kelloway Bath Oolite	660ft.
Coal Measures Sandstone, Claystone Shales, Clays	20ft.
Coal struck at 1,204ft.	

In bringing this paper to a close, I have to acknowledge my indebtedness for the facts which I have recorded to the article in the *Builder*, to which I have alluded, also to a short

paper by Professor Boyd Dawkins in the *Contemporary Review*, and to M. Burat's "Geologie de la France," from whose work I have largely quoted. It is possible that some of the information here set down may have to be revised and corrected by reference to information of a later date than that to which I have had access.

THE FUNGI OF WARWICKSHIRE.

BY W. B. GROVE, M.A., AND J. E. BAGNALL, A.L.S.

(Continued from page 213.)

Tribe III.—Inoloma.

343. **C. violaceus**, *Fr.* *Ag. violaceus*, With. Edgbaston, Oct. to Dec., *With.*, 204.

344. **C. callisteus**, *Fr.* Woods. Oct. Burton Green Wood, Kenilworth, *Russell, Illustr.*

345. **C. bolaris**, *Fr.* In woods. Oct. School Rough, Marston Green, among leaves, 1886; very striking specimens, agreeing exactly with Fries' description, the beautiful saffron-red colour being "very elegant."

346. **C. pholideus**, *Fr.* In woods. Oct. Windley Pool, Sutton Park, 1888.

Tribe IV.—Dermocybe.

347. **C. ochroleucus**, *Fr.* Woods. Oct. Dale House Lane, Crackley Wood, 1871, *Russell, Illustr.* Trickley Coppice, 1883 and 1889; Duke Wood, Wappenbury; Hurdle Hall, near Bickenhill.

348. **C. tabularis**, *Fr.* Woods. Oct. Common. Woods near Kenilworth, *Russell, Illustr.* The Spring, Kenilworth, 1881; Sutton Park; Bradnock's Hayes; Langley; Trickley Coppice; Packington Park.

349. **C. caninus**, *Fr.* Oct. Kenilworth, *Russell, List.* Olton Reservoir; Trickley Coppice; Umberslade.

350. **C. anomalus**, *Fr.* *Ag. araneosus*, With., Purt. Woods. Sept.-Oct. Edgbaston Park, *With.*, 198. Oversley Hill; Arrow, *Purt.*, ii., 635. Warwick, *Perceval.* Trickley Coppice; School Rough, Marston Green; Maxstoke; Bentley Park; Newlands Wood, near Hatton; Wappenbury.—Withering's and Purton's plants are referred here by Berkeley, *Eng. Fl.*, p. 86, but, I think, hardly with certainty.—W. B. G.

351. C. **sanguineus**, *Fr.* Woods. Oct. Crackley Wood, *Russell, Illustr.* Combe Ridings, *Adams.* School Rough, Marston Green ; Sutton Park.

352. C. **cinnamomeus**, *Fr.* *Ag. cinnamomeus*, Purt. Woods. Oct. Oversley Wood, *Purt.* iii., 220. Crackley Wood, Kenilworth, *Russell, Illustr.* Trickley Coppice ; pine wood, near Coleshill Pool ; Windley Pool, Sutton Park.

353. C. **uliginosus**, *Berk.* Damp woods. Crackley Wood, Kenilworth, Oct., 1871, *Russell, Illustr.*

354. C. **raphanoides**, *Fr.* Woods. Burton Green Wood, Oct., 1866, *Russell, Illustr.*

Tribe V.—Telamonia.

355. C. **bulbosus**, *Fr.* *Ag. bulbosus*, Purt. Woods. Oct. In Oversley Lane, leading to the Mill, upon the bank next the river Arrow, 1811, *Purt.*, ii., 637. Kenilworth, Oct., 1875, *Russell, Illustr.* Cut-throat Wood, near Solihull.

356. C. **torvus**, *Fr.* Woods. Rare. Sept.-Oct. Burton Green Wood, and wood near Kenilworth, *Russell, Illustr.* Meriden ; Marston Green ; Spernall.

357. C. **armillatus**, *Fr.* Sept. Amongst grass, Coleshill Pool, 1883, magnificent specimens.

358. C. **hinnuleus**, *Fr.* *Ag. farinaceus*, var. 2, Purt. Sept.-Oct. On Marriage Hill, between Bidford and Salford, *Purt.*, iii., 214. Crackley Wood ! 1872, *Russell, Illustr.* Combe Ridings, *Adams.* Hampton-in-Arden ; Shirley.

359. C. **brunneus**, *Fr.* *Ag. spongiosus*, With. Packington Park, *With.*, 197. Fries identifies his species with Withering's (*Hym. Eur.*, p. 381). Trickley Coppice, Oct., 1889, during the Fungus Foray of the Vesey Club, in company with Dr. Cooke.

360. C. **periscelis**, *Fr.* Boggy ground, Birmingham Road, near Kenilworth, *Russell, Illustr.*

361. C. **iliopodius**, *Fr.* Woods. Sept. Wood near Warwick, *Perceval.* Woods, Kenilworth, *Russell, Illustr.*

362. C. **hemitrichus**, *Fr.* Oct. Lawn, Ansty Hall, *Adams.* Sutton Park, a single specimen.

363. C. **rigidus**, *Fr.* Trickley Coppice ; specimens agreeing well with Fries' description were found Oct., 1889, during the Fungus Foray of the Vesey Club.

364. C. **paleaceus**, *Fr.* Sept.-Oct. School Rough, Marston Green ; Corley Woods.

Tribe VI.—Hydrocybe.

365. **C. armeniacus,** *Fr.* Wood. Oct. Burton Green Wood (?) and Crackley Wood, Kenilworth, *Russell, Illustr.*

366. **C. castaneus,** *Fr.* Woods and fields. Local. Sept.-Oct. Burton Green Wood, Kenilworth, *Russell, Illustr.* Trickley Coppice; Bradnock's Hayes; pastures near Oldbury Hall; Shawberry Wood; Coleshill Pool; Olton Reservoir; Duke's Wood, Wappenbury; Haywood; Alveston Pastures; Grove Park.

367. **C. leucopus,** *Fr.* Woods. Oct. Birmingham Road, and Crackley Wood, Kenilworth, *Russell, Illustr.* (*C. rigens*). High Woods, Combe, *Adams.* Trickley Coppice.

368. **C. decipiens,** *Fr.* Woods. Oct. Burton Green Wood, Kenilworth, *Russell, Illustr.* Trickley Coppice, Oct., 1883, *Dr. Cooke.* Ansty, *Adams.* Brown's Wood, Solihull.

369. **C. acutus,** *Fr.* Woods. Crackley Wood, Sept., 1870, *Russell, Illustr.*

Genus V. GOMPHIDIUS. *Fr.*

370. **G. glutinosus,** *Fr.* *Ag. velatus,* With., Purt. Oct. Pine woods. Plantations at Packington, *With.*, 161. Ragley Woods, *Purt.*, iii., 186. Combe Ridings, *Adams.* Causton, *Rugby Sch. Rep.* Pine wood, Coleshill Heath.

371. **G. viscidus,** *Fr.* *Ag. rutilus,* Purt. Pine woods. Oct. At Kinwarton, *Rufford in Purt.* ii., 629. School Close Avenue, *Rugby Sch. Rep.* Kingswood, *Hawkes !* Pine wood above Coleshill Pool; Packington Park; Hams Hall.

372. **G. gracilis,** *B. and Br.* *G. stillatus,* Cooke. Pine woods. Oct. Rare. Wedgnock Park, *Perceval.* Fir wood near Warwick, *Russell, Illustr.* Coleshill Heath.

Genus VI. PAXILLUS.

373. **P. involutus,** *Fr.* *Ag. adustus,* With. *Ag. contiguus,* With., Purt. Woods. Frequent. Sept.-Oct. Edgbaston Park, under oak trees! *With.* 174. In the churchyard at Kinwarton, *Purt.* ii., 627. Ansty; Combe, *Adams.* Crackley Wood! Kenilworth, *Russell, Illustr.* Sutton Park; Trickley Coppice; New Park; Kingsbury Wood; pine wood, Coleshill Heath; Packington Park; Solihull; Haywood; Kingswood; Olton; Corley; Oversley Wood, &c. The variety *excentricus truncigenus,* Schæff., t. 71, has occurred at Coleshill Pool and Windley Pool, Sutton Park, in the latter case growing from a tree trunk 3ft. above the ground.

Genus VII. HYGROPHORUS.

374. **H. chrysodon.** *Fr.* Woods. Rare. Crackley Wood, Kenilworth, Oct., 1870, *Russell, Illustr.*

375. **H. eburneus,** *Fr.* *Ag. nitens,* With. Woods. Oct. Packington Park, *With.*, 153, *Eng. Flora*, v., 13. Waysides, Maxstoke; lane from Whitacre Station to Duke End—*Ag. nemoralis,* With., Oversley Wood; Ragley Wood, *Purt.*, iii., 225, may possibly belong here.

376. **H. arbustivus,** *Fr.* Woods. Sep. The Spring, Kenilworth, *Russell, Illustr.*

377. **H. olivaceo-albus** *Fr.* Woods. Oct. Wood near Warwick, *Perceval.* Birmingham Road, Kenilworth, *Russell, Illustr.*

378. **H. hypothejus** *Fr.* Woods and waysides. Rare. Oct. Wood near Warwick, *Perceval.* Under fir trees, Combe Ridings, *Adams.* Heathy waysides, near Coleshill Pool; pine wood, Coleshill Heath; Sutton Park; Water Orton.

379. **H. pratensis,** *Fr.* *Ag. fulvus,* With. Fields and waysides. Sep.-Oct. Edgbaston Park, *With.*, 176. Warwick, *Perceval.* Meadow and Abbey Fields, Kenilworth, *Russell, Illustr.* Combe Fields, *Adams.* Four Oaks; Middleton Heath; near Coleshill Pool; Langley; Water Orton; Watling Street, near Three Pots; Corley, &c. *Ag. ericeus*, With., 170, "Packington Park; Edgbaston Park," and *Ag. clavæformis*, With., 172, "garden field, Edgbaston," are probably only pale varieties of *H. pratensis.*

380. **H. virgineus,** *Fr.* *Ag. eburneus,* With. Fields, &c. Frequent. Oct. Edgbaston, *With.*, 152. Warwick, *Perceval.* Dunn's Pits Lane, and Crackley Wood! Kenilworth, *Russell, Illustr.* Fields, frequent, about Ansty, *Adams.* School Close, Bilton; Newbold, *Rugby School Rep.* Sutton; Middleton; Coleshill Heath; Olton, near Three Pots, Watling Street; Packington Park; Corley, &c.

381. **H. ventricosus,** *B. and Br.* Amongst grass. Very rare. Kenilworth, *Russell, Cooke, Illustr.*, t. 901.

382. **H. russo-coriaceus,** *Fr.* Fields by Clarendon Villa, Kenilworth, October, 1875, *Russell, Illustr.*

383. **H. distans,** *Berk.* Pastures. Aug.-Sep. Dunn's Pits Lane and Echo Field, Kenilworth, *Russell, Illustr.* Kingswood, October, 1874.

384. **H. ovinus,** *Fr.* *Ag. compressus,* With. In patches on the rising ground opposite the stews, Edgbaston, June 28, 1792, *With.*, 239.

385. **H. Colemannianus,** *Blox.* Grassy places, Twycross, Warwickshire, *Blox.* School Close, *Rugby School Rep.*

386. **H. ceraceus,** *Fr.* *Ag. ceraceus,* With. Pastures. Dry pastures, Edgbaston, *With.*, 258. Pastures by the Castle, Kenilworth, *Russell, Illustr.* Fields, Ansty, *Adams.* Fields near New Park; Shustoke Railway Station, October, 1882; Baddesley Clinton, 1884; abundant, Coughton; pine wood, Coleshill Heath; Packington Park; Sutton Park, &c.

387. **H. coccineus,** *Fr.* *Ag. psittacinus,* var. 2, With. Pastures. Local. Sep.-Oct. Edgbaston, *With.*, 259. Warwick, *Perceval.* Kenilworth; Stoneleigh Deer Park, *Russell, Illustr.* Combe Fields, *Adams.* Knowle, *Hawkes.* Witton; Sutton Park; Middleton Heath; Langley; Water Orton; Whitacre; Shustoke; Hartshill; near Wolvey; Coleshill Pool and Heath; Olton; Arrow.

(To be continued.)

Helix nemoralis and hortensis.—I should be very pleased if you would ask the various conchological readers of "The Midland Naturalist" to kindly furnish me with their records of these two shells. What I specially want to know concerning them is as follows:—What varieties (with band-formulæ) have they found? What number of each variety and band-variation have they taken? What is the environmental condition of the localities where they have found them, as regards plant-life and geological formation? And, in addition, I want the records (and this is a special point) from separate and distinct hedges or banks.—J. W. Williams, 57, Corinne Road, Tufnell Park, London, N.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Biological Section. September 9th. Mr. J. Levick in the chair. Mr. W. R. Hughes exhibited *Campanula hederacea*, the Ivy-leaved Bell-flower, from Yelverton, Dartmoor. Mr. W. H. Wilkinson exhibited *Epipactis latifolia*, *Fumaria pallidiflora* (rare), *Ruscus aculeatus*, *Euphorbia paralias*, *Cuscuta europæa* (rare), and a frond of *Scolopendrium vulgare* double from the base; also a collection of butterflies, including *Pyrarga Megæra*, *P. Egeria*, and *Argynnis paphia*, all from Ilfracombe; also a fungus *Agaricus rachodes* from Sutton. Mr. Bolton exhibited a specimen of water net weed, *Hydrodictyon utriculatum.*—Geological Section. September 16th. Mr. T. H. Waller, B.A., B.Sc., in the chair. Exhibits: By Mr. Walliker, a twin apple grown in garden of Mr. Storey, of Erdington. Mr. Wilkinson, on behalf of Mr. Howell, lichens from Iceland, pumice, amygdaloidal lava, chalcedony, &c. Mr. Bolton, *Ophrydium versatile.* Mr. Wilkinson, on behalf of Mr. Grove, lichen *(Lecidea chalybeia)* on flint, from Chesil Beach.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION. August 18th. Mr. P. T. Deakin showed a series of photographs of river scenery, &c., taken in Hampshire and Dorsetshire; Mr. H. Hawkes, a collection of local plants, also a specimen of Salvia from South Africa, calling attention to the special modification of the anthers in these plants, to enable them to profit by insects' visits; and under the microscope, seed of *Pulmonaria officinalis*.—Aug. 25th. Mr. J. Collins exhibited a collection of mountain mosses made in Yorkshire, by Mr. J. A. Wheldon; also a series mounted for the microscope; Mr. P. T. Deakin, specimens of *Zonites excavatus* and *Vertigo edentula* from Hampshire; Mr. G. H. Corbett, shelly limestone from the Lower Lias beds, Wilmcote.—Sept. 1st. The President, Professor Hillhouse, M.A., F.L.S., gave an account of a recent visit to Norway, and exhibited a series of interesting objects from that country. The lecturer said the Vice-president of the Vesey Club (Mr. J. B. Stone) arranged the excursion, and much local and general interest was excited by it, so much so that even London dailies condescended to notice it, though not with their customary accuracy. The party was divided into two sections taking different routes, an overland party and a sea party, the two meeting at Trondhjem. The lecturer accompanied the first section, and gave an account of the different modes of transit, railways, roads, and the vehicles used, and boats. The geological theory of Norway once being joined to Scotland was referred to, but the lecturer thought the botanical evidence, with the exception of one plant, *Primula scotica*, was against it. The botany of Norway was very interesting; one plant, *Artemisia norvegica*, had only two habitats, Norway and the Rocky Mountains. Was this evolved 6,000 miles apart, or were these two habitats ever joined? At the close of the lecture, a collection of plants was exhibited, also a series of photographs of natural scenery, &c., a model of an old wooden church at Borgund, said to date from the 12th century, and other objects of interest. A hearty vote of thanks was passed to the lecturer.—Sept. 8th. A paper was read by Mr. H. Insley—"Notes on the Discovery of an Ancient Coal and Iron Mine near Coseley." The writer said a letter appeared in a local paper a few months ago, announcing the discovery of a number of "old men's" workings in the Coppice Hall Colliery, near Coseley, and inviting anyone interested in the subject to visit and inspect them. The writer availed himself of the opportunity. The colliery now being worked as an open works exposed to view several cones, about eleven in number. A careful examination showed a series of old workings, near to each other. The shafts which were bell shaped and about 19 feet deep were sunk for the purpose of getting gubbin ironstone and coal to calcine it, and a hollow, lined with clay was found where this process had been carried out; cinders and half calcined ironstone giving abundant evidence of this operation, preparatory to its being put into a cupula as primitive as those used by the Zulus at the present time. When the shafts were worked out, they were filled up with coal and slack that years had tended to consolidate, and when the surrounding beds had been removed, they formed the cones above referred to. What is the date of these workings? is a subject for speculation. Was it the work of the Monks of the Dudley Priory of about the 12th century, or did they belong to more ancient times? The rudeness of their method of working put them back to remote days, probably not later than nine or ten centuries ago. At the close of the paper, a plan of the workings, photographs of the cones, and specimens of calcined ironstone, &c., were shown.—Sept. 15th. Mr. H. Hawkes exhibited a collection of plants from the Arley district. Mr. P. T. Deakin, a series of volutes from the Eocene beds at Barton, remarking that of the 32 species occurring in England, 10 were found in the Barton beds.

ORGANIC DEATH.*

BY F. T. MOTT.

PRESIDENT OF THE MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

We are accustomed to take for granted that organic life implies organic death; that every living thing if let alone will die of itself; that in each species there is an average limit of life, and that no individual of that species can much exceed that limit.

To some extent this doctrine has been disputed. I propose to consider the question, whether it is founded upon sufficient evidence.

Do things die, or are they always killed?

It has been pointed out that unicellular organisms which propagate by fission are practically immortal; that under normal conditions they simply grow and divide, that each division grows and divides again, and that this process may go on *ad libitum* without any approach to death. Weismann asserts that the germ-cells of the higher animals are of this immortal nature, and that whereas the somatic or body cells necessarily and entirely perish with the death of the individual, the germ substance is passed on from generation to generation. It is an axiom in mechanics that a body once set in motion will continue to move in the same direction, and with uniform velocity, until something stops it or turns it aside. Mechanical forces do not die: they are always killed. If organic forces are of the same nature, it would seem probable that the same law applies to them.

Glancing down the pages of organic history we observe that numbers of families, genera, and species have appeared at various epochs, have increased in numbers, in size, and in variety, and have at some subsequent epoch decreased and finally disappeared. There are two possible explanations of this fact. Each of these groups may have come into existence with a certain definite life period intrinsically belonging to it by reason of the nature of its originating force: a certain career which it must go through; *or*, each group may have been simply crushed out of existence by the development of stronger competing forms, or starved to death by a gradual change of climate. The tendency of modern evolutionary science is to accept the second explanation; to believe that genera and species do not die of themselves, have no intrinsic tendency

*Read at the Annual Meeting of the Midland Union of Natural History Societies, held at Leicester, September 18th, 1890.

towards death, but are killed by changes of environment. There is much to be said in favour of this theory. It harmonises with the fundamental law of mechanical force, and there is nothing in our personal experience of genera and species to disprove it. They appear to be permanent and unchangeable until some change in their surroundings alters their course or stops them altogether.

But the contrary theory, that organic force is always periodic and must necessarily be dissipated at an epoch which is only variable within certain limits, has also some weighty evidence in its favour.

Although our experience of genera and species is consistent with the theory that they might continue for ever by perpetual reproduction unless destroyed by external changes, our experience of *individual* organisms is that they always and necessarily die after living for a certain period which is practically definite in each species. It can scarcely be maintained that individuals are always crushed out of existence by competitors, or killed by changed surroundings. A man on an island without other human inhabitants, though he had abundant food, would die of old age within a century; and if the period between human birth and death could be considered as long enough for fatal changes of environment, this law could not apply to the much shorter lives of the smaller mammals, and birds, or to those of such insects as live but a few days.

It seems impossible to account for the constancy and the regular periodicity of death in all individual organisms, except as the result of their intrinsic constitution. The immortality attributed by Weismann and others to unicellular organisms can be nothing more than *specific* immortality. The individuals perish though the species is continued; for, when a cell divides into two independent individuals, the original individual has ceased to exist. The moment of fission is the moment of death.

I think it is indisputable that individual life is a periodic phenomenon which must terminate regardless of external influences. But if this be so, is it probable that species, genera, orders and classes are subject to the same law? It may be, of course, that in these cases the periods are so long that we cannot actually observe the beginning and ending of any one of them, and that even the 4,000 or 5,000 years of written history are quite insufficient to include any such record, while yet their periodicity might be as distinct as that of individual lives to the eye of a less limited observer. Yet it seems also possible that the law of periodicity may not apply to them, for there is assuredly a wide difference between the constitution of an individual and that of a species.

An individual consists of an aggregation of matter, whether in the simplest or most complex form, the whole of which is under the control of a single will. Parts of that aggregate may be cut off and perish, leaving the controlling will intact, but when the entire individual dies the controlling will vanishes. A species consists of an aggregation of individuals, but, as far as we know, they are not controlled by any single specific will, so that, though all the individuals should die, leaving no representative of the species, yet no actual thing would vanish except those individuals.

In man there is direct consciousness of his individuality. In the other vertebrates there is at least the consciousness of sensation. How far down in the scale of being anything which can properly be called consciousness exists we do not know, but the *mental faculty* must be present in all animals and probably in plants also, for no possible line can be drawn anywhere between the Amœba and the Ape, above which mental faculty can be supposed to have its beginning. The first phenomenon of individual death is the disappearance of this mental faculty. The separation of the aggregated material follows afterwards. But in the death of a species there is no such first stage. The entire phenomenon is comprised in the separation and disappearance of the aggregated individuals. This difference is a very important one, and as the death of a species is not threfore strictly analogous to the death of an individual, so the life of a species may not be subject to that law of periodicity which so evidently controls individual life. But is there any evidence of periodicity in species, genera, and other groups, from such knowledge of their history as we areable to obtain. not from personal observation only, but with all the resources of science? Periodicity, in the sense in which I am using that word, may be defined as a tendency to pass through a series of changes within a definite time, the scheme of changes and the period within which they are to be executed being predetermined in the constitution of the organism.

There is ample geological evidence that within the limits of each great sub-kingdom of animal and vegetable life there has been a successive change of genera, and that within the limits of each genus there has been a similar successive change of species.

If it can be shown that the scheme of these changes, whether in genus, species, or individual, is distinctly analogous; that the order in which certain characters succeed each other is constant; that the beginning, the middle, and the ending of each developing group bear always,

or generally, the same kind of relation to each other, it will go far to prove that the controlling force is an internal rather than an external one, because the almost infinite diversity of external influences makes it inconceivable that there should be any constant analogy among schemes of change moulded by those external influences alone.

Now, if we consider the scheme of change in an individual, whether animal or vegetable, we may observe among a vast number of details four leading factors. Let us take an individual of one of the higher orders, a vertebrate, or a phanerogam, in which all these four factors are distinctly exhibited. Every such individual is at the beginning simple in structure, soft and cellular in substance. This is the first stage of its development. In a very short time solidification of certain parts commences, with increase of size up to a definite point. This is the second stage. Meanwhile the muscular, fibrous, contractile tissues have been attaching themselves to these solidifying parts, and slowly developing; but they do not reach their full maturity, their greatest tenacity and elasticity, until some time after the cessation of growth. When they reach that maturity the third stage of development is accomplished. The fourth stage consists in the maturing of the great nervous system, the organs of sensation, perception, thought, and passion, which do not reach their climax till late in life, when all the other factors are beginning to decline. The maturity of the nervous system is soon followed by decay of power and the inevitable death.

This is the sequence of change in all individual life. First, the cellular stage. Second, the osseous stage. Third, the fibrous stage. Fourth, the nervous stage, and then dissolution.

I have taken the names of these stages from the animal world as being the higher in rank and showing the characteristics of each more completely. The corresponding stages in the vegetable world are:—First, the cellular, which is similar in both. Second, the woody stage. Third, the leaf stage, with its attachments to the solid framework, and its traces of contractile power. Fourth, the blossom stage, with its concentrated energy and marvellous powers of adaptation, suggesting an approach to instinct.

Can any such sequence of change be traced in the development of species, genera, and orders?

It may easily be understood that to trace the sequence of change in any *species* must be extremely difficult. In the first place the bservations of cientific men do not extend over a

sufficient period for important specific changes to have occurred within that period; and in the second place, any noticeable change of form or size among fossil examples would almost certainly be referred to a distinct species.

Precisely the same difficulties must attend the attempt to trace the progress of a genus. It is only in the larger groups, which include a wider range of difference, that a body of evidence can be collated sufficiently extensive to give satisfactory results.

Take, for instance, the class of Fishes. It is almost certain that it originated with some group of soft-bodied animals allied to the Amphioxus and the Lamprey, in which the solidification had gone only so far as to produce a cartilaginous notochord. This was the first stage. The second is represented by the Sharks, Rays, and Sturgeons, in which the skeleton, though only cartilaginous, became fully developed, and the greatest increase of size was attained. The third stage is illustrated by the Teleostei, the comparatively small, but very active fish of modern times; the trout, salmon, herring, &c., in which the muscular power is greatly developed in proportion to the size.

Take, again, the Reptilian group. Originating in some soft, semi-ossified amphibian, developing into the gigantic bony Saurians of the Lias, and then into the much smaller, but marvellously muscular, branches of the Birds on one hand, and the Snakes on the other. In the Birds, if not in the Snakes, the rise of the fourth stage, the stage of nerve and brain development, is shown; and shown in connection with the usual phenomenon of decreased bulk, the most intelligent of the Bird class being undoubtedly found among the Insessores.

The great class of the Mammals began with some small, simply organised Marsupials, expanded in the second stage into huge Ungulates, Proboscideans, and Carnivores, and has now in its third stage lost bulk but gained in muscular development, as evidenced in the lithe Felidæ, the persistent hunting Canidæ, and the swift Horses and Antelopes.

The total sub-kingdom of the Vertebrata exhibits a similar sequence from the soft-bodied Ascidian and Amphioxus, through the bony Reptiles, to the muscular Birds and Mammals, and finally to the intelligent Man.

In the vegetable world the first beginnings are still represented by the cellular Cryptogams. The second stage was the epoch of gigantic Lycopods and Coniferæ, in which the woody system predominated, with small development of foliage. In the third stage came the forests of broad-leaved Exogens with inconspicuous flowers; and the fourth stage is

now in progress, adorning the world with brilliant blossoms, chiefly on plants of smaller size, shrubs and herbs, and creepers.

There is assuredly considerable evidence that in organic groups, as well as in individuals, this sequence of change is constant. It would be more convincing if we were able to trace it in species, or even in genera. There are, indeed, certain indications of it in some few genera, as for instance, in the Pelican, the present form of which is distinctly smaller than the remains of an apparently identical bird found in the fens of England. The existing European Crane, also, is smaller than the form of which bones are found in some French caves. So also the Norwegian Elk is not so large as its giant ancestors, nor the Elephant as its predecessor, the Mammoth. But whether with this frequent decrease of size there is associated a greater proportion of muscular power, or of intelligence, there is scarcely sufficient evidence to show.

In the case of the Dodo, a gigantic pigeon, all the records seem to indicate that it was a heavy, stupid creature, the extinction of which was largely due to its want of activity and intelligence; and so far it corroborates the supposition that gigantic size represents an early phase of development, before the muscular or nervous tissues have reached maturity.

But if the evidence in favour of a uniform scheme of organic change is weak, I think the evidence to the contrary is still weaker. Has any group, animal or vegetable, begun with large, bony forms, changed into small and muscular ones, and then returned to the condition of giants?

Are any of our modern cellular cryptogams the descendants of forms which have ever possessed woody trunks or true foliage, or brilliant flowers?

There may be instances of degeneration, but the characters lost are superficial, and do not go so far as a reversion from one of the primary stages to a previous one.

Taking all the evidence together, I think it points to the probability that there is one uniform law at the bottom of all organic progress; and that this law operates in species, genera, orders, and kingdoms, as constantly as in individuals. It is a law of periodicity, a fundamental condition of organic life, in obedience to which every individual and every group must go through a definite and predetermined career, predetermined by the condition of its originating germ, and must finally die without reference to any external cause.

This does not of course imply that all organisms *accomplish* their predetermined career. Multitudes are killed prematurely. The number which die are indeed but a minute

fraction of the number which are so prematurely killed. Of the innumerable seeds produced by plants not one in 10,000 will germinate, and of those which do germinate not one in a thousand will reach maturity. Nevertheless, those which do reach maturity will inevitably die of themselves at last,

So also with a species. It originates from some germ which varies abnormally from its parent. This germ fulfils its destiny, produces seeds, and dies. One of these seeds varies in the same direction as the first, but a little more widely. It also produces seeds and dies, and this process may go on until a point is reached at which variation in that direction ceases. A new species is then established, which may go on reproducing itself with little variation for a long period. But though the normal variation may be little, it is sure and inevitable, and will tend always in the direction of the next of the four stages beyond that from which it started. If its first germ was the seed of a Conifer, there will be a normal tendency to vary in the direction of broader foliage, and the change of constitution which that implies. This tendency may not become visible for very many generations, but in perhaps ten or twenty thousand years a perceptible change will have taken place—a change, however, which no living man would naturally perceive, and, with the prevailing views of scientists, if the earlier form were found as a fossil it would not be accepted as belonging to the same species. I shall here no doubt be met by the objection that a species is not a definite entity, but only an arbitrarily separated portion of a continuous current of change.

This is the prevailing view at the present time, but it can hardly be said to be proved. Is not the chain of life *really* a "chain" of many links, varying in size, but, though in unbroken contact, separated by nodes, these nodes representing those points and periods of *special* change which I have elsewhere called "critical epochs?"

Is not a true species a variety which has passed a "critical epoch," beyond which it cannot again revert, and which within its narrow limits will expand, pass through the normal organic phases and die, *as a species*, the branching chain being continued by some of its variations, which also pass beyond other critical epochs and become definite links themselves. On this hypothesis a genus will be a group of such branches of the chain all emanating from one node, and passing as a group through the same series of changes to ultimate death.

This law of periodicity does not contravene the law of natural selection. Selection is not a force in itself; it is

the result of the interaction of forces. It does nothing but give more or less play to natural tendencies. It is, in fact, a system of barriers stopping the progress of organic force in certain directions and leaving it unchecked in other directions. It can kill, but it cannot give life. It can destroy, but it cannot create. If the general tendency of organic force were retrogressive, selection could not alter it, but would only retard the retrogression. The fact that under the influence of the law of natural selection the life of the world has become continually richer, more complex, and more beautiful, proves that there is in the fundamental force by which that life is carried on an innate tendency in that direction. If, then, organic force differs from mechanical force, in that the one carries with it its own law of dissolution while the other perishes only from external resistance, can any reason for this difference be imagined, either physiological or metaphysical?

Mechanical force exhibits itself in various ways, either as a simple motion from point to point in space, or as a simple oscillation passing over the same space in contrary directions, or as an undulation which is a continuous succession of oscillations, or as a system of rotations with centripetal and centrifugal actions nearly balancing one another, as among celestial bodies.

Organic force does not exhibit itself in any of these forms, but has a special form of its own. An organism is a centre which continually draws to itself surrounding material as food, storing up the energy of that material until a certain degree of progressive concentration is attained, beyond which it has no power to pass. Having reached this climacteric, the concentrated energy begins to disperse, and organic death soon follows.

In all the forms of mechanical force the dispersion of the energy is due to some external opposing force of friction, or repulsion, or adhesion. In organic force that dispersion may be due to some form of resistance, but it is *internal* and independent of its surroundings.

All energy is doubtless fundamentally the same throughout the universe, but its modes of action are various, and if we imagine its action in the organic world to be in the form of a concentrating instead of an undulatory wave, we find in that difference a possible explanation of organic periodicity and Organic Death.*

*The discussion on the President's Address and an account of the Excursions will appear in a subsequent number.

PLANT MARCHES.

BY J. B. STONE, J.P., F.G.S., F.L.S.

In following the story of the progression of plant life, from the rank vegetation of the Carboniferous period to the glorious flora of the present age, some remarkable facts are encountered, which not only invite the attention of botanical students, but are important guides in determining the broad outlines of geologic science.

The more philosophical reasoning is applied, the more evident is it that botanical knowledge is needed to aid the solution of the many and unexpected problems which are constantly arising, when tracing the world's history in its geological records. It is especially useful, if not needful, to possess some knowledge of the causes which have influenced and directed the geological distribution of the flora of recent times, as the application of the same natural laws assists in determining phenomena occurring through series of geological epochs.

For instance, certain types of plants—whose presentments are recorded in fossils—connote by their presence certain climatic conditions which, by analogy, we may pretty nearly determine, and in the prevailing presence or in the remarkable development of certain vegetable forms, temperature and chemical atmospheric conditions may be correctly assumed. As an illustration, the presence of fossil plants and their seeds embedded in the rocks of Arctic latitudes, whose surviving representatives require conditions of a temperate or hot climate to sustain life and permit them to fructify, would indicate climatic change and possibly something more, for it may also demonstrate an altogether different arrangement of land areas, if not of continents, with a consequent difference in the flow of tropical currents to the Poles.

Among the more noteworthy effects of great geological changes, is the circumstance that the typical flora of any geological epoch practically ceased with the epoch ; either submergence of land, or some other equally destructive agency, swept away the main plant-life of the period, and such straggling survivors as fortuitous circumstances permitted to escape and perpetuate their race were singularly few.

It is extremely rare to find any species continuing an existence through more than one geological period, and the exceptions which reappear in a subsequent age, or have a still longer tenure of existence, possess more than an ordinary interest, and may be considered as being worthy of special attention, contributing, as they do, additional information as to existing conditions common to the respective periods.

The cryptogamic flora of Carboniferous times finds many surviving relations in the Ferns, Lycopodiums, and Horsetails of our day, and if the exact species are not now present, yet there is sufficient likeness to assure us of the near relationship. These hardy warriors, which have enjoyed such a prolonged existence, are not insignificant historians of the past.

We observe the survivors now living possess a more or less vigorous life amid certain surroundings and influences suited to their existence. With the same favourable conditions intensified, it is not difficult to imagine the circumstances of life enjoyed by their ancient and more noble ancestors—warmth, shade, moisture, and more liberal supply of carbonic acid gas—and we may conjure to our imagination a picture of rich verdure and luxuriant growth, not unlike a possible arrangement of tree ferns, with rank, marshy undergrowth and mossy environment, in our day. Again, consider what a venerable and varied history belongs to the great tribe of plants known as the Needle Trees, embracing the whole family of pines, which has held an uninterrupted course of existence through countless ages, through every kind of climatic change, and in all parts of the world. Its representatives outstrip all competitors in endurance, they collect nutritive carbon from the highest altitudes, they are invigorated by the bracing winds of high latitudes, they thrive in the sunny south, and exist amid the arid sand dunes of the desert. They climb the mountain sides and cover valleys with verdure throughout the whole world.

Splendid as is their position to-day, their record of power and endurance is still better. They have the charm of possessing a long, long history, they ennoble themselves by counting among their members the monarch of all trees, the giant Sequoias (Wellingtonias) of California, and their first ancestors must be sought for in Carboniferous, or perhaps even in Devonian times.

Another interesting survival from the Mesozoic Age—that is, in the progressive flora immediately following the Cryptogamic plants of Carboniferous times—is the Gingko tree of China (Salisburia). In Mesozoic times separate species of these elegant fan-leaved trees were plentiful, but in our time they have been reduced to the single representative species mentioned. This tree has now found its last retreat in Eastern Asia, though it readily grows and thrives throughout temperate Europe and in America as far north as Montreal. In the Mesozoic period it occupied, with many diversified species, all the regions named and even Siberia and Greenland.

Although the abundant vegetation of the Carboniferous period is well represented at the present time in the Cryptogamic plants already referred to, and the Pines and other trees of Mesozoic ages are in good evidence, it is in the much later deposits of the Cretaceous period that we must seek for the ancestors of many of the more advanced forms of vegetable life which at present adorn our woodlands, among which may be reckoned finely developed types of the Poplar, Oak, many kinds of Salix (Willow), Juglans (Walnut), Alder, Magnolias, Beech, Chestnut, Platanus, Tulip Trees (Liriodendron), &c.

The abrupt extinctions of the flora at the terminations of geological epochs already referred to, are followed by the remarkable circumstance of the equally sudden appearance in the succeeding periods of apparently new vegetable creations.

There are eminent botanists living who decline to accept the view that these new types are the modified or changed forms of still more remote ancestors, whose intermediate characters are untraceable owing to some hiatus in the records of the world's history, and who express a preference to wait for some new revelation of science, which may throw more light upon the creation of complex organisms. Whilst I believe we have only to await further research for connecting types, I make reference to these opinions for the sake of calling attention to the fact that evolution, in its strictest sense, is not accepted by all botanists.

I have already remarked that the submergence of land at the close of geological epochs—the Carboniferous period for instance—was a ready cause of the extinction of existing plant life, and after such a wave of destruction there would be but scant remains of the magnificent vegetation of the preceding period. Upon the re-appearance of the land in a later age, plant life again spread over the world, but entirely from new centres, and it is remarkable that although the influence of the destructive forces has frequently, in the world's history, driven the whole vegetable world from north to south, and the cessation of such adverse influences has again permitted its return—always however impoverished through its travels—yet all available data indicate that new and vigorous types of plant life have all proceeded from northern centres.

Many interesting facts present themselves in connection with these Marches of Plants. Hardy plants from the north, either from compulsion or natural inclination, made successful war against vegetable occupants already in possession, and as they advanced southwards, and for the most part improved in size and beauty, they destroyed their more feeble opponents.

Not so happy, however, was their return journey northwards when opportunity occurred. To say nothing of having to meet with new invaders from the north, they had become enervated through the genial influence of a more southern climate, and were now unequal to the ordeal of a return journey, consequently but a small proportion of the plant life of a former geological period found its way back to its old home.

Another interesting result of these Plant Marches is to be found in the possible breaking up in the meantime of the previously existing land areas, which presented to the returning army impassable barriers of sea-girt lands, or snow-capped mountain chains; sometimes isolated areas, such as islands, or groups of islands, nourished and preserved for ages its stranded flora, or such of it as had been able to outlive internal strife. These isolated spots are of extreme interest, whether with reference to fossilised, or existing, plants, as many ancient types have thus been more carefully and perfectly preserved.

The disastrous effects of these insurmountable barriers upon the returning flora were the more telling, and the damage more apparent in Europe than in America. Over the latter continent it would appear—from Carboniferous times downwards—the floral Marches were more readily accomplished than in the eastern hemisphere, consequently there has always been on the American Continent an earlier appearance from the north of new types, and as less difficulties had to be encountered on return journeys, old types lingered longer, and eventually found their way back and re-established themselves further north than was the case in Europe and the east.

The life of the Tulip Tree, already mentioned, is an instructive illustration of varied fortunes of plant migration, or, as I have termed it, the Plant March of its period. In Europe the Tulip Tree, like many of its American associates seems to have been destroyed by the cold of the Ice period, the Mediterranean cutting off its retreat. In America, however, it migrated southward over the southern extension of the continent, but returned far northward again with the amelioration of climate.

The March and dispersion of plants through physical changes is strikingly illustrated in the scattering of the Northern Flora, driven southward at the time of the great Glacial period. Without commenting on the causes or duration of this later chapter of geological history, it will be sufficient to refer here to the general effect upon vegetation. To whatever

latitude the great ice sheet descended there must be taken also into account the effect of such an accumulation of ice, which must have abstracted heat from regions extending into Asia and Africa. There are irresistible proofs that once upon a time a temperate climate, if not indeed a climate of sub-tropical sweetness and warmth, extended as far north as Greenland and the borders of the present Polar Seas, and continued through many geological periods; this is evident from the fact that rich and luxuriant vegetation flourished there. These favourable conditions certainly existed in the Eocene age; then commenced a gradual falling, which continued until the close of the Pliocene, compelling the migration of a rich and interesting native flora.

A little later, and the earliest snows and ice of the forthcoming Glacial age put in an appearance, and were peremptory in their notices to quit, when the more tender species migrated or perished. The severity of the increasing cold drove the flora before the ever increasing glacier, and in turn the lands of Scandinavia were passed; the North sea area—then land—was crossed, England, France and Switzerland were traversed; the Alps, Pyrenees, and Apennines were occupied, and the chilly influence of the vast icy region pushed forward the northern plants southward, som e even as far as the Atlas Mountains, and the Himalaya. Corresponding events happened upon the American Continent. From the Polar Sea the plants were driven over the lands of the Hudson Bay Territory, across Washington Territory, through Canada, and far along the range of the Rocky Mountains. The same history also belongs to Northern Asia, Russia, and Siberia.

When at last the force and energy of this ice invasion had expended itself, the returning warmth began gradually to melt the accumulated ice, and the retreat of the glaciers commenced. The hardy plants which had accustomed themselves to the severity of glacial conditions, and had learnt to flourish on the borders and even amid the depths of the ice fields, followed closely the retreating ice, and found their way once more northward.

It was now their turn to make a struggle for existence. Many perished from the attacks made upon them from their approaching southern enemies, now strengthened and encouraged by the increasing warmth, others retreated to bracing altitudes in mountainous chains, and were cut off from the main army advancing northwards. Colonies were left here and there, on the Alps, the Pyrenees, the Carpathians, the Caucasus, the Apennines, on the Scotch and Welsh mountains,

along the range of Scandinavian hills, before the shattered forces once again reached the Arctic Seas, and, for aught we know, may be still advancing towards the North Pole, for there is nothing to show that we have yet arrived at the anti-climax of the glacial age ; indeed, we may assume that it is within the bounds of possibility for Greenland to be again the earthly Paradise it has been--a rearrangement of land areas which would form a land-locked Arctic sea would certainly make that possible.

It is not to be wondered at that botanists find a world of interest in these colonies of northern plants, left stranded upon the hills and mountains of far-off lands, severed entirely from each other, often separated by hundreds of miles without a single representative existing in the intervening space. Sometimes remarkable instances occur of the survival of single species in particular localities, such as on Dartmoor or the Peak of Derbyshire, in the forests of Germany or on the Harz mountains, all of which contribute evidence to the interesting story. Nor is the history nearly worked out yet. Diligent students throughout Europe and America are noting new information daily. In the Alps, Dr. Christ, Dr. Correvon, and Dr. Wolf are assiduously working, and their labours are throwing an entirely new light upon the subject. The latest reports from these eminent scholars declare that there are plant colonists settled in the Alps from the Himalaya, from the Atlas Mountains, Siberia, Kamtschatka, China, and Japan—from America North and South, New Zealand and Australia—from Turkestan, the Caucasus, Greece, the Carpathians, the Apennines, Dalmatia, Corsica and the Isles —from the Sierra Nevada and the Pyrenees, besides those known to inhabit Scandinavia and the North Seas. This indicates that either the glacial plant army of the North was more completely shattered and broken up than has been suspected, or there must have been other centres of plant creation of the same typical Alpine character, with climatic conditions permitting a transportation of species between countries lying far apart.

In making out progressive development of vegetable life, and particularly of floral structures, much uncertainty must always exist as to the period of time when the earth was first adorned with bright-petalled flowers.

The Carboniferous measures enshrine the more elementary form of cryptogamic vegetation, and the succeeding periods present us with evidence of advanced forms, but it was not until Cretaceous times that we discern the dawn of Dicotyledonous plants, and even then the records of petalled flowers

are uncertain. We know, however, that at this period the landscapes were ornamented with the gorgeous blossoms of kingly magnolias. We may also assume that the limes wafted perfume through the woodlands, and the graceful tulip tree hung its fairy bells of beauty, but we are not so sure about that great creation of herbaceous plants which contributes now such conspicuous beauty to the world. It may probably be correct to assume that such plants existed to a larger or smaller extent, but the records are insignificant, owing probably to their perishing more easily and completely than do the foliage and fruit of woodland trees. Whilst the decaying influence of seasons quickly rots plants of the moorlands or the undergrowth of woods, the falling leaves of larger trees dry up, and decay is arrested, and if the toughened texture of the original leaf is not actually treasured up in the folds of the earth, perfectly veined skeletons bear evidence of form and character. Seeds, particularly nuts, are records of importance and interest in determining plant life-history, and it will be easily understood how, from their unchanging nature, this may be so.

In the earlier history of the earth then, there were no jewelled flowers to adorn it, the grand beauty of the fern paradises of Carboniferous times was not relieved by the brilliancy of floral colour, and even when the first true flowers appeared, with the primitive reproductive organs of stamen and pistil—yet, petalled flowers were still unborn. It was not until ages upon ages had passed over the world's history that the mountains, the heaths, and the woodland valleys became clothed with the myriads of lovely gems which now adorn them.

HISTORY OF THE COUNTY BOTANY OF WORCESTER.

BY WM. MATHEWS, M.A.

(Continued from page 204.)

The second series of the "Phytologist," edited by Alexander Irvine and published by William Pamplin, was commenced in 1855. Six volumes appeared, bearing date 1855-6 to 1862-3. It contains many notices relating to the botany of Worcestershire.

In Vol. I., at p. 151, we find an account of "A Visit to Wyre Forest, Worcestershire," from the pen of Mr. T. W. Gissing. Mr. Gissing omits to state that a large part of the Forest, north of Dowles Brook—about half of the entire area —is in the county of Salop, and another portion in the

county of Stafford. Some confusion is thus caused in the records. The whole forest is situated on the coal measures, and, with some exceptions, has the same characteristic flora. Mr. Gissing's visits were made in July, 1854, and June, 1855 and on both occasions he was accompanied by Geo. Jorden. On the former visit, Mr. Gissing writes:—"It was Mr. Jorden's good fortune to discover a single plant of the rare Neottia æstivalis" in the "great bog," on the Worcester side of the Forest.

The notice concludes with the first published list of the characteristic plants of the Forest; and includes a few species from other localities in the neighbourhood of Bewdley. I select the following species:—

* **Clematis Vitalba.**
* **Aquilegia vulgaris.**
* **Viola palustris.**
* **Drosera rotundifolia.**
* **Hypericum montanum.** Blackstone Rock.
* **Geranium sylvaticum.**

‡ **G. sanguineum.** *On the Shropshire side only. Never seen on the Worcester side of the Forest.*

* **Euonymus europæus.**
* **Rhamnus Frangula.**

Rubus saxatilis. *I have myself only seen this on the north side of Dowles Brook, but Dr. F. Arnold Lees gathered it on the south or Worcester side in 1883.*

* **Pyrus domestica.** The one solitary tree.
* **P. torminalis.**
* **Epilobium roseum.**
* **Galium tricorne.**
* **Carduus acaulis.**

Doronicum Pardalianches. By a ditch side a little below Bewdley.

* **Erica Tetralix.**
* **Pyrola media.** Mr. Jorden.
* **P. minor.**
* **Veronica scutellata.**
* **Scutellaria minor.**
* **Lithospermum officinale.**
* **L. arvense.**
* **Anagallis tenella.**
* **Orchis pyramidalis.**
* **Gymnadenia conopsea.**
* **Habenaria chlorantha.**
* **H. viridis.**
* **Neottia** (*Spiranthes*) **æstivalis.** Margin of the great bog. *Never seen again in this locality.*
* **Listera** (*Neottia*) **Nidus-avis.**
* **Epipactis palustris.** Great bog.

* **E. (*Cephalanthera*) ensifolia.** Near the old Sorb Tree.
* **Convallaria majalis.**
* **Triglochin palustre.**
* **Juncus squarrosus.**

Eriophorum latifolium. It is doubtful whether this species was intended by Perry. See his list of 1831, "Mid. Nat.," Vol. X., p. 261.

* **Carex pulicaris.**

C. curta.

* **C. fulva.**
* **Melica nutans.**
* **Lastræa Oreopteris.**
* **Botrychium Lunaria.** In Habberley Valley for some years.
* **Equisetum hyemale.**

At page 281 is an account of the Botany of Wyre Forest, by Mr. Geo. Jorden himself. He adds to the above list:—

Thalictrum minus.

* **Rhamnus catharticus.**
* **Vicia sylvatica.**

Rubus saxatilis. In several localities; *probably, therefore some in Worcester.*

Pyrus Aria.

* **Gentiana campestris.**
* **Orobanche major.**
* **Lathræa squamaria.**

Potamogeton plantagineus. (*I presume P. polygonifolius is intended.*)

* **Spiranthes autumnalis.**
* **Lycopodium clavatum.**

No definite localities are given for any of these plants, and it is doubtful whether Thalictrum minus, Pyrus Aria, and Gentiana campestris were found in Worcester or Salop.

On p. 362, Mr. W. Cheshire announces the discovery, on the 10th July, 1853, in the Avon, at Evesham, of Anacharis Alsinastrum, Bab. *(Elodia canadensis). This was anticipated by the notice in the "Worcestershire Chronicle" of the 31st Aug., 1853.*

In Vol. II. page 244, October, 1857, is a notice of Mr. Alexander Irvine's "Illustrated Handbook of the British Plants;" and at page 321, a notice of Parts II., III., and IV. The four parts were published as a single volume by Thomas Nelson and Sons, in 1858. This work contains records of the following species, gathered by Mr. Irvine in the neighbourhood of Clent, probably in 1857:—

Epipactis media, p. 323. In Uffmore Forest, near St. Kenelm's, Clent Hills, Worcestershire.

† **Scrophularia Ehrharti**, p. 446. Is plentiful in the valley between the Clent Hills (Clatterbatch), and is not associated with either of the species to which it is intermediate.—A. I.

* **Campanula rapunculoides**, p. 497. On the roadside between Churchill Station and Clent; but always near houses, and not plentiful. It is probably naturalised.—A. I.

* **Erodium maritimum**, p. 752. Clent, opposite the Church, at the foot of the hills.

Elatine hexandra, p. 755. In a millpond near Churchill, Worcestershire.

E. hydropiper. In a millpond near Churchill Railway Station; with the former.

At page 385 of the same volume of the Phytologist, April, 1858, is a paper by Mr. Irvine "On the Botany of the Clent Hills," in which he describes the rarer plants of the neighbourhood, including most of those quoted above from the Handbook.

Scrophularia Ehrharti is not mentioned, and I conclude that the record in the Handbook is an error.

Epipactis media is a new record, unless it be the same plant as *E. purpurata* of Smith. "Uffmoor Forest" should be "Uffmoor Wood." This species has been gathered by the writer, not in Uffmoor Wood only, but in nearly every wood in the upper valley of the Stour. Mr. Irvine considers it identical with *E. purpurata*. See Handbook, p. 323; see also English Botany, 3rd Edit., Vol. IX., p. 123. Mr. Watson combines the *E. media* of the Manual with *E. purpurata* and *E. violacea*. See Top. Bot., 1st Edit., p. 372.

Erodium maritimum. Has not been seen at Clent by any other botanist.

The two Elatines are a puzzle. "In one millpond near Churchill Station," writes Mr. Irvine, in the Phytologist, p. 401, "we had the good hap to discover both our Water Pepperworts." Every millpond near Churchill Station has been repeatedly searched by competent botanists, without yielding the slightest trace of either species. We find, nevertheless, in Watson's Topographical Botany, p. 77, under the head of Elatine Hydropiper, "Worcester, Irvine, sp." Moreover, Irvine's specimens of this species, communicated to Mr. Watson, are in the Watsonian Collection in the Herbarium at Kew. It is difficult to understand why specimens of E. hexandra were not sent to Mr. Watson with those of the other species.

The third and fourth volumes, 1858-60, do not contain any matter relevant to the county of Worcester.

In Vol. V., July, 1861, p. 219, is a notice of a meeting of the Worcestershire Naturalists' Club, held at Malvern on the 15th of May, when Poterium muricatum and Gagea lutea were gathered. This is the first county record for Pot. muricatum, which was discovered near the Wych by the Rev. J. H. Thompson. It will appear shortly that there is an earlier record for Gagea lutea.

In Vol. IV., August, 1862, under date 20th June, 1862, Mr. Geo. Jorden records the destruction by fire, in 1855, of the old Sorb Tree of Wyre Forest, Pyrus domestica, Sm. See Botany of Worcestershire, p. 74.

A few Worcester plants belonging to the Malvern district are recorded for the first time in the Transactions of the Malvern Naturalists' Field Club. Part I., Worcester, 1855; Part II., Malvern, 1858; Part III., Worcester, 1870.

Part II. commences with the anniversary address of the late Rev. W. S. Symonds, the Rector of Pendock. It contains, at p. 19, a list of plants added to the Malvern Flora, since the publication, in 1852, of the 2nd edition of the Botany of the Malvern Hills, from which I select the following:—

* **Myosurus minimus.** Powick, near Ham Cottage, 1856, Mr. T. Westcombe. Not noticed at Malvern since the time of Withering.

Centaurea solstitialis. Fallow field near Great Malvern. Miss Dyson.

Gagea lutea. At the bottom of Purlieu Lane. *First discovered by the Rev. Dr. Cradock, in 1855. See "Botany of Worcestershire," p. 67.*

* **Polypodium Dryopteris.** A new locality has recently been found for this fern on the western declivity of the Worcestershire Beacon, by Mr. E. Lees.

(*To be continued.*)

Errata.—On pp. 202-3 for Chesshire read Cheshire. For Jordan read Jorden.

THE FUNGI OF WARWICKSHIRE.

BY W. B. GROVE, M.A., AND J. E. BAGNALL, A.L.S.

(*Continued from page 239.*)

388. **H. miniatus,** *Fr.* Moist heaths. Local. Oct. Kenilworth, *Russell, List.* Sutton Park; pastures, Kenwalsey; footways, road from Hinckley to Nuneaton; heathy waysides, Coleshill Pool; Packington Park; Grove Park.

389. **H. puniceus,** *Fr.* Fields. Rare. Sep.-Oct. Field near Kenilworth, *Russell, Illustr.* Combe Fields, *Adams.* Sutton Park; Langley; Grove Park.

390. **H. conicus,** *Fr.* *Ag. aurantiacus,* var. 1, With. Pastures. Sep.-Oct. Edgbaston Park, *With.* 257. Warwick, *Perceval.* Kenilworth, *Russell, List.* Combe, *Adams.* Sutton Park; footways near New Park; Kingsbury; Shustoke; Coleshill Heath; Solihull; Hampton-in-Arden grounds; Marston Green; Berkswell; Grove Park; Arrow Lane.

Var. *b. lutea.* Aston Lane, Birmingham.

391. **H. calyptræformis,** *B. and Br.* *Ag. aurantiacus*, var. 4, With. Pastures, Edgbaston, by the long stew in the Park, *With.* 258. Warwick Castle Park, *Perceval.* Kenilworth, *Russell, List.* Fields, Shilton, *Adams.*

392. **H. chlorophanus,** *Fr.* Pastures. Rare. Oct. School Close, *Rugby School Rep.* Hopsford, *Adams.* Baddesley Park! *Hawkes.* Middleton Heath; Kingsbury; Edgbaston Park; Marston Green; Corley.

393. **H. psittacinus,** *Fr.* *Ag. aurantiacus*, var. 3, With. *Ag. psittacinus*, With. Fields and waysides. Not rare. Sep.-Oct. Edgbaston Park, *With.* 257-9. Warwick, *Perceval.* Kenilworth, *Russell, List.* Witton! *Hawkes.* Combe! *Adams.* Sutton Park; Middleton; Kingsbury; Kenwalsey; Packington Park; Coleshill Pool; Langley; Marston Green; Coughton; Arrow.

394. **H. unguinosus,** *Fr.* Pastures. Rare. Oct. Kenilworth, *Russell, List.* Hopsford, *Adams.* In a field, Corley; Grove Park.

Genus VIII. LACTARIUS.

395. **L. torminosus,** *Fr.* *Ag. torminosus*, Purt. Woods and roadsides. Local. Aug. to Oct. Oversley Wood! *Purt.* ii. 626. The Hall Lane, Ansty, *Adams.* Lane leading to Hams Hall; Shustoke.

396. **L. cilicioides,** *Fr.* *Ag. Necator*, var 2, With. Woods. Rare. Sept.-Oct. Under large Spanish chestnut trees in the Park at Edgbaston, *With.* 176. Kingsbury Wood; New Park, Middleton; Langley; Trickley Coppice.

397. **L. turpis,** *Fr.* Woods. Local. Sept.-Oct. Trickley Coppice; New Park; Coleshill Pool; pine wood, Coleshill Heath; Sutton Park; Edgbaston Park; Marston Green; All Oaks, Cathiron Lane; Hams Hall.

398. **L. controversus,** *Fr.* Fields. Rare. Oct. Under poplars, Hopsford, *Adams.* Field in lane from New Park to Langley Brook, in the company of *Dr. Cooke,* Oct., 1884.

399. **L. insulsus,** *Fr.* Woods. Rare. Oct. Burton Green Wood, Kenilworth, *Russell, Illustr.* Ansty Fields, *Adams.* Haywood; Alveston Pastures; Packington Park; Berkswell.

400. **L. zonarius,** *Fr.* *Ag. zonarius*, With., Purt. Borders of woods. Rare. October. Dam of the great pool in Edgbaston Park, *With.* 190. Arrow and Oversley Hill, *Purt.* ii. 632. Crackley Wood! Kenilworth, 1872, *Russell, Illustr.* Crackley Wood, 1881.

401. **L. utilis,** *Weinm.* On the ground. Very rare. September. Field near Grove Park. *Cooke, Illustr.* 1084. This was the first time this had been recorded for Britain. It was very abundant, and varied in the size of pileus from about 3 to 8 inches broad.

402. **L. blennius** *Fr.* *Ag. Listeri,* var. 5, With. Woods. Rare. October. In Lord Aylesford's Park, at Packington, *With.* 157. Combe Wood, *Adams.* Edgbaston Park; Baddesley Clinton.

403. **L. hysginus,** *Fr. Ag. depressus,* With. Woods. Edgbaston Park! *With.* 178. Crackley Wood, Kenilworth, *Russell, Illustr.* Water's Wood, Maxstoke.

404. **L. circellatus.** *Fr.* Red Lane, Kenilworth, September, 1866, *Russell, Illustr.*

405. **L. uvidus,** *Fr. Ag. livido-rubescens,* With. Woods. Rare. August to October. Edgbaston Plantations, *With.* 172. Combe Ridings! *Adams.* Water's Wood, Maxstoke; Windley Pool; Coleshill Pool; Four Oaks; Langley.

406. **L. pyrogalus,** *Fr.* Woods and meadows. August to October. Crackley Wood; Burton Green Wood; Red Lane, Kenilworth, *Russell, Illustr.* Combe Wood, *Adams.* Shawberries Wood, Shustoke; New Park; Trickley Coppice; The Grounds, Hampton-in-Arden; The Grounds, Baddesley Clinton; Rowington; Coleshill Heath; Packington Park; Shirley Street; Spernall.

407. **L. chrysorheus,** *Fr.* Woods. October. Birmingham Road, Kenilworth, October, 1866, *Russell, Illustr.* The Ridings, Combe, *Adams.* Corley.

408. **L. plumbeus,** *Fr.* Woods. Rare. Crackley Wood, *Russell, Illustr.* Combe, *Rugby Sch. Rep.* Stoneleigh, *Perceval.*

409. **L. pergamenus,** *Fr.* Woods. September-October. Kingswood; Ragley and Oversley Woods; Cubbington and Waverley Woods, near Stoneleigh; Wainbody Wood, near Kenilworth.

410. **L. piperatus,** *Fr.* *Ag. Listeri,* var. 2 (?) With. Woods, under large beech trees, Edgbaston, *With.* 157. Crackley Wood, Kenilworth, *Russell, Illustr.* Combe Woods, *Adams.* Water's Wood, Maxstoke; Newlands Wood, near Hatton.

411. **L. vellereus,** *Fr.* *Ag. Listeri,* Sow. 104, Purt. Ragley Wood; Oversley Woods, *Purt.* ii. 624. Crackley Wood, Kenilworth, *Russell, Illustr.* Combe Woods, *Adams.* Water's Wood, Maxstoke; Alveston Pastures; Packington Park; Edgbaston Park; New Park; Spernall.

412. **L. deliciosus,** *Fr.* Woods. September-October. Under fir trees, Combe Ridings, *Adams.* Sutton Park; Coleshill Pool; pine wood, Coleshill Heath; Cathiron Lane.

413. **L. pallidus,** *Fr.* Woods. October. Lodge Wood, Warwick, *Perceval.* Combe, *Adams.* Trickley Coppice; New Park, Middleton; Water's Wood, Maxstoke; Four Oaks.

414. **L. quietus,** *Fr.* Woods. September-October. Warwick, *Perceval.* Kenilworth, September, 1872, *Russell, Illustr.* Combe! *Adams.* Sutton Park; Trickley Coppice; New Park; Water's Wood, Maxstoke; spinny near Three Pots, Watling Street; pine wood, Coleshill Heath; Solihull; Burton Green; Berkswell; Marston Green; Packington Park; Corley; Bradnock's Hayes; Cubbington Wood; Grove Park; Haywood, &c.

415. **L. theiogalus,** *Fr.* Woods. October. Burton Green Wood, Kenilworth, *Russell, Illustr.*

416. **L. cyathula,** *Fr.* Wedgnock Park, *Perceval.* Burton Green Wood, October, 1863, *Russell, Illustr.*

417. **L. rufus,** *Fr.* Fir woods. September to November. Warwick, *Perceval.* The Spring and Burton Green Wood, Kenilworth; Old Park Wood, Warwick, *Russell, Illustr.* Combe Park, *Adams.* Sutton Park; New Park, Middleton; pine wood, Coleshill Heath, and Pool; Alveston Pastures; Four Oaks.

418. **L. glyciosmus,** *Fr.* Fir woods. September-October. Combe Ridings, *Adams.* New Park; Trickley Coppice; Shawberries Wood, Shustoke; Water's Wood, Maxstoke; Windley Pool; Sutton Park; Edgbaston Park; Coleshill Pool and Heath; Solihull.

419. **L. fuliginosus,** *Fr.* Woods. October. Warwick, *Perceval.* Crackley Wood, Kenilworth, *Russell, Illustr.* Ansty, *Adams.* Shepherd's Wood, Solihull; Packington Park.

420. **L. volemus,** *Fr.* Combe, *Rugby Sch. Rep.*

(To be continued.)

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—General Meeting, September 30th. The President (Mr. C. Pumphrey) in the chair. Mr. T. V. Hodgson exhibited zoological specimens from Brazil, including three snakes (one *Dendro-*

phis), a squilla, millipedes, scorpions, and several pupæ; also an interesting echinoderm. Mr. Bolton exhibited under the microscope living specimens of *Lacinularia socialis*, showing the group and an individual with its internal structure. Mr. H. W. Wilkinson exhibited, from the neighbourhood of Ludlow, a collection of plants, including *Myrrhis odorata*, *Campanula Trachelium*, *Fumaria pallidiflora*, *Verbascum Thapsus*, and *Colchium autumnale;* also a fine collection of lichens, including *Graphis scripta*, *Umbilicaria pustulata*, *Calicium hyperellum*, *Peltigera polydactyla*, *Evernia furfuracea*, and *Cetraria aculeata*.—General Meeting, October 7th. This was the first meeting of the winter session, and most of the sections of the society were well represented. The President (Mr. C. Pumphrey) occupied the chair, and there was a good attendance of members. Two new members were proposed for election. The numerous objects exhibited were duly explained, and many further examined by the aid of a number of microscopes. Mr. C. Pumphrey exhibited, for Mr. C. D. Sturge, an abnormal leaf of the chestnut, similar in venation and form to the oak leaf. He exhibited some fine specimens of *Physalis Alkekengi* in fruit, and also showed under the microscope the club-shaped hairs in the flower of the snapdragon. Mr. W. R. Hughes, F.L.S., *Daphne Mezereum*, in fruit. Mr. W. B. Grove, M.A., a fungus from Dudley Castle, *Hemiarcyria clavata*, and others of the Myxomycetes; also *Torrubia militaris*, from a garden at Edgbaston. Mr. C. J. Watson, an interesting collection of flowers and plants from Norway. Mr. G. M. Iliffe, the male and female glow-worm from Capel Curig. Mr. Thomas Bolton, living specimens of *Plumatella repens*, *Cordylophora lacustris*, and *Hydrodictyon utriculatum*. Mr. W. H. Wilkinson, section of a lichen, showing its internal structure and seed spores *in situ*. —Biological Section, October 14th. Mr. W. B. Grove, M.A., in the chair, and about 80 members and friends present. Messrs. G. H. Dugard and Steele Elliott were unanimously elected members of the society. Mr. W. R. Hughes, F.L.S., exhibited fruit of Spindle Tree (*Euonymus europæus*), from Gloucester. Dr. A. Milnes Marshall, M.A., M.D., D.Sc., F.R.S., then delivered a lecture on "Animals' Pedigrees," which he illustrated with a series of beautifully painted diagrams. He said that the pedigrees of any two individuals (no matter how widely separated from one another), if both could be traced back far enough, would ultimately unite in a single progenitor, and he proceeded to show some of the kinds of evidence on which the biologist bases his conclusions as to the pedigrees of species of animals now living. He pointed out the supreme importance of embryology in this regard, and especially of the theory of recapitulation. Of course this recapitulation is not perfect; the history is often broken or distorted, and so violently changed that it is difficult to grasp its real meaning. But, on the other hand, it is often so plain that the truths it enforces do not admit of a doubt. In an early stage of life the crab has a tail as long as a lobster has in the same stage, and it is clear that both crab and lobster are derived from a long-tailed ancestor. The lecturer then considered the subject of degeneration, which he explained by the fact that the "survival of the fittest" does not mean that the ideally most perfect will survive, but the one which, on the whole, is most suited to its environment. So a man entering a shop to buy an umbrella will select, not the one which most nearly approaches ideal perfection, but the one which best hits off the mean between his various likes and dislikes in the matter of umbrellas and the money he is prepared to give for it. We ourselves, he said, are perfect museums of degenerate rudimentary organs, physically and mentally—in speech, in manners, and in dress. As an example, he mentioned the small muscles which are found in the lobes of the ear. These, with us, are entirely functionless, and can only be explained by inheritance from a more fully-equipped ancestor. At the close of the lecture a hearty vote of

thanks to the lecturer was unanimously carried.—Geological Section, Oct 21st. Mr. C. Pumphrey in the chair, in the unavoidable absence of Mr. Waller. Mr. A. Browett exhibited a spray of the liquorice plant, from Pontefract, and a smooth-coated horse-chestnut. Mr. J. Udall, F.G.S., read a note on "The Bone Bed of Ludlow," illustrated by specimens from Ludford and Norton Hill, near Norton Camp.—Sociological Section, October 2nd. Mr. Herbert Stone exhibited a number of plants attacked by gall insects; also several specimens of *Lychnis dioica*, in which through the atrophy of the pedicels several flowers were crowded together so as to form a beautiful compound head similar to a capitulum.—October 23rd. Mr. W. R. Hughes, F.L.S., in the chair. A letter of apology was read from Professor Hillhouse, who could not attend to deliver his lecture on account of indisposition.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—September 22nd. Mr. Round showed a slab containing fossil leaves and a flower from the Bournemouth leaf beds; Mr. H. Hawkes, a fungus, *Diachæa elegans.* The subject for the evening was "Practical Microscopy." Mr. J. W. Neville gave a short address on plant crystals and how to prepare them for the microscope. The speaker said there was no royal road to mounting, and it was impossible to mount a leaf to show its whole structure satisfactorily. In mounting crystals we generally lost other cell contents, and in trying to preserve the protoplasm of the cell we lost the crystals. The process recommended was to bleach the leaves in chlorinated soda, and when quite transparent mount in balsam through carbolic acid, and afterwards view with polarised light. A collection of slides mounted in this manner was shown under the microscope. Mr. H. Hawkes exhibited a series of slides of dissections of leaves and flowers; Mr. J. Collins, slides of fresh-water algæ, the cell contents of which had been fixed by picric acid.—September 29th. Mr. Frost exhibited a series of physiological and other micro-slides under a number of instruments.—October 6th. Mr. G. H. Corbett exhibited a slab of coal measure shale from Bristol, covered with impressions of a fern (Pecopteris); Mr. Round, an album of flowering plants and ferns, mostly from the Lake District; Mr. H. Hawkes, specimens of fungi, *Arcyria punicea* and *Stemonitis ovata*; Mr. J. Madison, an unusually large specimen of *Anodonta cygnea* from Maxstoke; Mr. Batley, an ice-polished and striated pebble from Northfield.—October 13th. Mr. Parker read a paper on "The Deathwatch Beetles." The writer said the power of superstition that held such sway over the minds of the community years ago had been gradually weakened by the light of scientific research. Of the many tokens observed in the household none were perhaps better known or more dreaded than the ticking of a harmless little insect known to the superstitious as the Deathwatch, from the belief that it foreshadowed the death of an inmate of the house. The fact that the ticking was generally heard in the silence of a sick room would account for the superstition. The writer showed that the peculiar noise was caused by the insect beating its head against its hiding-place, and that it was not caused by one insect only but by several, four at least being credited with it—*Anobium tessellatum*, *A. striatum*. *A. pertinax*, and *Atropos pulsatorius*. A description of the life-history of each was given. The peculiar noise they made had caused them to receive a large share of attention, which had showed that they were only fulfilling the ordinary duties of life. Drawings of each insect were shown.

The Vesey Club Excursion to Norway.—The completion of this paper by Professor Hillhouse is postponed till next month.

THROUGH NORWAY WITH THE VESEY CLUB.

(*Continued from page 201.*)

As the overland party is now complete, and fairly launched upon that portion of its travels which is of the deepest interest alike to geologists and to botanists, and as neither the space at my disposal nor my own inclination is consistent with anything of the nature of a diary of our journey, I will call a temporary halt for the purpose of saying a few collective words about Norwegian travelling in general, premising that Norway is not a country in any way suited to pedestrian tourists, although the average rate of travelling does not much exceed that of which a first-rate walker is capable. Railways, too, are few. Connecting the new capital, Christiania, with the old, Trondhjem, is the line upon which we have travelled, but, though the section to Eidsvold was in existence when I first visited Norway in 1874, the full line was opened, I believe, only a couple of years ago. A few other short local lines, and Norwegian pieces of main lines, make up a total length of probably between 750 and 800 English miles. The bulk of Norwegian travelling is done in one of four ways: inland, either on horseback or by driving; on water, either by rowboat or steamboat. To deal with land travelling first. The country is covered by a very coarse network of roads, most of them old, and following the natural contour of the ground over which they were made, but a few new and engineered. Besides these roads, and maintaining a subsidiary connection between various points, are horse-tracks of various quality. As the country is very sparsely peopled, towns in the inland being nearly unknown, villages very rare, and the proportion of mountains to population very high, it follows that roads are few and far between, and horse-tracks not very numerous. In our 54 mile drive yesterday we passed only one branch road, and that decidedly rudimentary. The old roads, such as we drove over from Lille-elvedal, are, in their history, there can be no doubt, improved horsetracks, made available for vehicles of a simple, narrow, and strong type. We go up hill and down dale, sometimes cross streams by elementary wooden bridges, sometimes ford them, and I may say that the fording of a mountain stream, swollen by long continued rains, and with its bed only a mass of rocks, is an operation which, in one's early experience, at least, is just a little sensational. The gradients on these roads are sometimes simply horrifying, 1 in 2 or 2½ being not at all infrequent over short pieces.

Coming down such hills is bad for the front teeth. The great main roads over Norway are five in number. (1) Lillehammer (for Christiania) to Trondhjem, over the Dovrefjeld; (2) Lillehammer to Veblungsnaes, for Molde, through the Gudbransdal and Romsdal; these two roads being common to Domaas, *i.e.*, about mid-way; (3) Bergen, over the Fille Fjeld and Valdres, or, as an alternative, Hallingdal* to Christiania; (4) from Christiania through the Thelemarken to Odde for Bergen and Stavanger; and (5) a coast road, connecting Stavanger, Christiansand, and Christiania. With the exception of Trondhjem, these five roads with their subsidiary branches, are the sole means of land communication between Christiania and any part of the south, west, north, or centre of Norway. Until recently these roads were all of the type of those already referred to, and which we may designate "surface" roads; but within the last dozen years or so they have been in gradual process of reconstruction, or, to speak more accurately, are being gradually replaced by new roads, the construction and engineering of which are worthy of the highest encomiums. The Dovrefjeld Road, for example, over which we shall be driving during the next few days, has no gradients so steep as those by which many an important English road is carried over rising ground; of this, however, more hereafter. These roads are all made by Government, but in most cases, have to be kept in repair by the local authorities. I believe that the old roads had to be maintained by the individual occupiers on the route, and at varying intervals, from a few yards upwards, by the roadside are posts indicating the occupier responsible for that section.

At irregular intervals along the roads, varying from five to twenty English miles, are situated what are called "stations," the owners of which are under contract with Government to either keep or obtain horses and vehicles for the travellers' use, and at a stated charge. Those which keep the horses, &c., are Faste Stationer, *i.e.*, fixed stations, but by the English tourist known as "fast stations," as at these your delay rarely exceeds half an hour; the others are known as "Tilsigelse Stationer," *i.e.*, summoning stations, the master of which sends for your horses to the neighbouring farmers, and charges a fee for so doing. These "slow stations," as English-speaking travellers popularly and very aptly call them, are now relatively scarce, and few exist on

*Through the Hallingdal a railway is prospected to connect Christiania with Bergen.

routes which tourists are likely to pass over. The station is often nothing but a farm house, in which, though in case of emergency no doubt travellers would stay, yet little or no special provision is made for their accommodation. But many of the stations on the frequented routes have one, or sometimes several, guest houses, generally separate from the dwelling house of the owner, and are capable of providing very comfortable quarters for sometimes forty, fifty, or more people. Of this kind is the station at Jerkin, which, in addition to providing accommodation for travellers and short stayers, is also a well-known sanatorium. Its guest accommodation is in three separate large buildings.

The Norwegian horses are usually small, rarely more than 14½ hands, and, of course, vary much in quality. Not infrequently the best horses come from, in other respects, the most indifferent stations. The vehicles for ordinary travelling are of two kinds. The national vehicle is the carriole, the body of which, shaped something like a slipper, and carrying only one person, is placed upon a pair of long shafts and forward of the axle, its relative ease in travelling being due to the elasticity of the shafts. On the better modern roads, new and improved carrioles are coming slowly into use, in these the body being mounted on springs. Behind the axle a board connects the shafts, and on this the luggage is fastened, and surmounted by your post-boy (or girl). The other vehicle in use is the stolkjaerre, or country cart, rather like a costermonger's cart, with a seat placed across and slightly elevated, and accommodating two side by side. Here also modern innovations are improving the quality, but even this year I have had to ride in one of these, the seat of which was simply placed across from side to side of the springless cart-body. Altogether, however, great improvements have been made in recent years, and the cushions which, warned by past experience, we took with us, though still as "grateful and comforting" as any conceivable cocoa, were not so thoroughly essential as of old. The harness, too, has improved, and repairs by means of string and extemporised wooden pegs are not such hourly features of travel as they were wont to be.

Boat travelling, whether on inland lake or western fjord, is subject to the same general conditions as that on land; and there are boat stations, fast and slow, akin to the horse stations already described. The boats are pointed at the stem and stern alike, and probably have in no way changed, whether for better or for worse, for hundreds of years. There are no rowlocks, but the oar passes through a roughly-made loop of willow, or more often juniper. Though in more

vigorous days I have manipulated a Norwegian oar for a dozen or more miles at a stretch, I am bound to say that their clumsiness and weight makes them entirely unsuited to an English oarsman, unless he be himself of the horny-handed waterman type. The number of the crew depends on the number of passengers and distance from station to station, but most usually is three, one of whom commonly pulls a pair of oars. Though on the most frequented routes steamboats ply daily, the rowboat is still in great request.

The Dovrefjeld, upon which we spent nearly a week, has not changed much with the passage of the centuries. Nearly eight hundred years ago, when, as till but the other day the whole of the land traffic from Christiania to Trondhjem passed over its bleak solitudes, Government established upon it four refuges for belated travellers, and endowed them with what we are apt to think a modern panacea, a "Government grant." These refuges or "Stuen," were Fogstuen, Jerkin, Kongsvold, and Drivstuen, and exist to this day in the form of the four fjeld stations, by which passes the newly-completed engineered road. The stations have changed with the years, but the fjeld, as of yore, is given over to absolute desolation. This we had ample opportunity of seeing, for on the day after our arrival we botanised up the Jerkinhö, a hill overhanging the station, and up which for a thousand feet the old and historic road climbed. While the majority botanised, a party of eight on this day made the ascent of Schneehatten (7,700 feet), under the guidance of Mr. Jerkin and his son, got lost in a snowstorm, and with great difficulty found their way to the shelter hut, where they passed the night. Whether they actually reached the summit or not I cannot make out. The fresh-fallen snow which we saw, made us somewhat anxious for the climbers; but our anxiety would have been greater had we fully realised then that guides, in the Swiss sense of the term, hardly exist in Norway; though, given an unimpeded use of their eyes, the peasants of the fjeld can steer to perfection.

A short journey next day (July 8th) over a nearly level road brought us to Kongsvold, and left us sufficient time for a walk high up on the fjeld to Mr. Kongsvold's saeter, or mountain farm, where the cows belonging to the station are kept during the summer and cheese-making season. Here are made those comical brick-shaped brown cheeses, which appear on the table at every meal, and are a never-ending source of amusement to the English traveller. The Norsk revel in cheeses, and the choicer forms are kept under glass covers. It has been irreverently suggested that this is to keep the smell in,

but the same joke has been made about the English cheese-cover. Certainly some of the Norsk cheeses are "high." On the Fille Fjeld once I "winded" a cheese store at more than a quarter of a mile distance; but in those days my nose was keen. I wish I had space to describe this saeter, all its appliances were so marvellously clean, and the fire-places, &c., so delightfully antique. But then, Kongsvold is a rich man as Norwegians go, and his cows, goats, and horses are his special pride. He has one greater pride though, and that is his grand-daughter, the most charming specimen of Norwegian maidenhood that we came across. All the unmarried members of the party—the males, that is—fell in love with her straight off, and if the married ones had not been securely held in they would have gone and done likewise. I am not quite sure whether in their heart of hearts they didn't. One love-lorn bachelor mourned over her for at least a week, and almost got pitched head first from the balcony of an hotel at which we stayed subsequently, for daring to ask the proprietor thereof (unmarried) to give him her photo, which he had in his album. Probably the only thing that saved him was the fact that he was twice as big and four times as strong as the rival in question.

Mr. Kongsvold's station—as the reader will have noted, country stations are generally named after the proprietor, and sometimes have been in the hands of the same family for many centuries—was a marvel. Norwegian houses are built in two principal ways, of roughly-squared logs, eight or ten inches in section, or weather-boarded with double walls. Weather-boarding is either effected by means of boards placed lengthwise, and overlapping one another, as is so common in English barns, or placed vertically with narrower strips over the junctions. The stuffing is dry moss. Weather-boarding needs more architectural skill, and lends itself freely to ornamentation by balconies, &c. The walls are painted usually a pale creamy white, though near Trondhjem we saw the most delightful harmonies in red and ochre. The roofs are commonly covered with big slabs of shale, put on diamond-wise; very generally in the smaller buildings they are thickly turfed, and covered with plants—pine and birch trees, eight or ten feet high, sometimes growing upon them. An interesting volume might be compiled upon the tectile flora of Norway. In this respect the cow-houses stand *facile princeps*. Every farm has one or more cow-houses for the cows when, in the winter season, they have to be kept under cover. The cow-house is generally built of hewn logs, two storeys high, and the upper storey approached by means of an inclined plane

of logs supported on log trestles. The entrance hall of a "guest-house" of a good Norwegian fjeld station is generally large, and strewn with small branches of pine and juniper mingled, the odour from which is pleasant, while they serve as a very effective mat. From this hall the reception rooms are entered. It will take years to efface from my memory the image of the drawing rooms at Kongsvold, their walls of the softest red, with the branches of ivy plants, growing in pots in the corners, trailed over them, lavishly furnished, and oh! so comfortable after a wet and tiring day. Those ivy plants are somewhat of a mystery to me. How do they manage to get them to grow so beautifully indoors? I can only answer the question by talking "at large" about a short, extremely light summer, and an atmosphere of perfect purity; but I suspect that winter guests are rare, and that in their absence the guest-rooms are practically unused, and the temperature is kept too low to stir the plants into weak premature growth. Of insect pests I saw not a trace. The soil used is intensely black, evidently almost a pure vegetable mould, and its surface is kept religiously stirred by a funny little miniature spade and rake, made either of bone or of brass. Probably the most important feature in a Norwegian, as in a German, room is its stove. In this respect the big drawing room at Kongsvold is exceptionally fortunate, for, in addition to the large closed stove, which is common with all rooms, it possesses a curious funnel-shaped, open fire-place, partly for heating, but mainly, I imagine, for the pleasure of the thing. Our journey was so wet that we had a duly appointed stoker, whose duty was to go ahead and fire up—not merely for the sake of the pleasant warmth, but mainly for drying purposes. Twenty-six more or less wet people, needed some drying, and our clothes and rugs were apt to overflow out of the kitchen department. A comic sight to be seen at every station, shortly after our arrival, was the stately stove, festooned about in all directions with six and twenty pairs of boots, more or less. Speaking of the "stoker" reminds me to say that every male member of the party had some definite official functions, either temporary, or for the whole excursion; and for each day, and each special expedition, a leader was appointed before the party left England. The stoker was not one of these original appointments. He was a result of the continued action of environment. Later on it became necessary to appoint a "testimonial writer," and this office was superadded to my botanical functions. I was not flattered thereby. A special gift for writing testimonials savours rather

much of the imaginative newspaper reporter. Fortunately, the three I had to concoct needed neither the *suppressio veri* nor the *suggestio falsi*, but it isn't always easy even to tell the truth neatly.

As between a quarter and a third of our time was spent therein, a word must be devoted to the Norwegian bedroom. Besides the ubiquitous stove, it contains one or more narrow, box-like bedsteads. A special peculiarity of many of the Norsk bedsteads is that they telescope sideways, so that when not in use the space they occupy can be much reduced. Unhappily, the bedclothes do not telescope; they remain permanently narrow. Nor do the bedsteads lengthen. How the Norwegians, who are by no means a short race, manage to submit patiently to their brevity is a puzzle to me. In more than one of our halting places the lady's bedstead was several inches shorter than the gentleman's, but, by way of compensation, was of a more ornate character. The unique feature of a Norwegian bedroom, however, is its mirror. This isof fair size, perhaps 18 × 12, and hangs upon the wall above the body level, but tilted forwards. Its frame is ordinary, much like a picture frame; the special feature is the glass itself. You have all probably observed the distortion, often the dislocation, of a chimney by common window glass; the Norwegian looking-glass does precisely the same kind of thing to the face. *Facile princeps* was our glass at Jerkin. Movement of the image across from one side to the other of this mirror, caused the features to writhe like those of a soul in mortal agony. Altogether, though, the stations we stayed at were decidedly comfortable; but some that we passed by, but did not stop at, suggested very much the reverse. The least comfortable at which we stayed was that at Aune. All wooden houses, however, are noisy, and you wonder what would occur if they caught fire. Security against this is the key to the building of a large station in several isolated sections.

Our days upon the Dovrefjeld were devoted to serious botanical and geological work, and for either of these purposes Kongsvold makes the best possible head-quarters. The station lies at the point where the valley of the Driva, the river which drains the Dovrefjeld towards the Atlantic, narrows from the high and open fjeld into a mere gully, a thousand feet or more in depth, along the bottom of which, and close to the tumbling boiling river, the road is for mile after mile blasted well-nigh continuously out of the live rock. Behind the station is Knutshoe (5,565ft.), probably the most remarkable botanical mountain in Europe, upon whose

schistose, boggy slopes the most extraordinary assemblage of alpine, boreal, and arctic plants lies scattered. Our day here will live in our memories when many other things have long faded away. In the Driva valley, and close to its ice-cold glacier waters, we found the so-called "Iceland poppy"—*Papaver nudicaule*, at home—and with it *Artemisia norvegica*, the proprietor of as strange a geographical distribution as plant could desire to have. On the shoulders of Knutshoe one of our first finds was the densely-tufted *Diapensia lapponica*, followed shortly after by that minutest of buttercups, *Ranunculus pygmæus*. I suppose our guides were used to that sort of thing, but the sight of four full-grown botanists (Mr. Stone, Dr. Fraser, Dr. Wilson, and myself) on hands and knees, in the driving rain and sleet, grubbing up a plant which a few good-sized rain-drops could have hidden from view, was calculated to disturb their faith in our complete sanity. After the excitement of our finds, a lunch on the open mountain-side, fully exposed to all the elements, with sloppy sandwiches and limp biscuits for our fare, caused no special comment. We worked our way up to the snow, administering occasional vivifying doses of brandy neat, trusting to its quite sufficient dilution by the water which was doing its best to enter our bodies from the exterior, and picking up from time to time some new treasure; but with these I propose to deal in a subsequent and special article.

Two sheet anchors we acquired in this expedition. One, a belief in the sufficiency of Knutshoe for an entire summer's holiday to itself; and the other a complete faith in the trustworthiness of the Norwegian horse for riding purposes. We shall not easily forget the last, and supreme, fragment of our descent of Knutshoe, when, our horses and ourselves alike fagged by a long day's work, we came to a piece of rough slope, steeper than the roof of many a house. Once on the slope, it seemed safer to keep on than to try to get off, yet one by one we tumbled off out ef sheer desperation, and floundered down on foot. Arrived safely at the bottom, Dr. W. and I, who were behind, compared notes. My saddle had slipped forward about five inches, but his so far that it only a little overlapped its own saddle-mark ! Yet the horses had faced it all cheerfully enough. I verily believe that a Norwegian pony could climb the wall of a Norwegian house, provided only that the weather-boarding were upside down.

While we were up Knutshoe the bulk of our party had faced the weather and gone up the mountains in search of a Lapp encampment, a herd of a hundred or so of the reindeer

belonging to which we had passed close to upon Knutshoe, while the geologists had stayed in the valley stone-breaking; for this neighbourhood is every whit as interesting to the geologist as to the botanist, whether to one who, like our veteran Dr. Crosskey, revels in glacial phenomena, or still more to one who, like my colleague Dr. Lapworth, is over head and ears in love with metamorphism. Marvellously beautiful indeed, even to the unknowing eye, are the altered conglomerates, the granites, and the gneisses of this wild region, and the recent passage of the Government road-making engineers saved our stone-breakers many a tough job.

Our journey hence to Trondhjem calls for little special remark. From a scenic point of view the gems were three; (1) the drive through the valley of the Driva, from Kongsvold to Drivstuen; (2) near Austbjerg, the junction of two streams, the Orkla and another, at a sharp angle, and with magnificent ravines; and (3) the valley at Stören. Near Stuen we passed, for probably several miles, over an ancient and well-marked moraine. At Bjerkaker our leader had arranged for us a piece of dissipation in the form of a peasant dance. In this district apparently Mr. Stone has a name to conjure by, and for miles around the peasantry, to the number of probably 150, had flocked in for a jollification; though, owing to the almost complete absence of national costume in the district, the gathering was no whit more picturesque, on the feminine side indeed less so, than a similar meeting in England would be. The dancing was interleaved with glee singing, on the part of our visitors and ourselves, and we likewise made a few experiments in the way of international athletic sports. We introduced, for example, a tug-of-war, three on a side, but the superior weight of the Norsk peasants made our defeat most ignominious. The first attempt, though, had a startling ending. When we asked for a rope, a native brought forward one of the long reins of twisted leather used in the country carts, and the six combatants planted their heels firmly, and stiffened their loins, to await the signal. This was given, and the moment the strain came on the rope it parted like a bit of twine, and six gallant champions performed back somersaults upon the grass. Tell it not in Crewe, whisper it not in the streets of Birmingham, for the three representatives of the might and prowess of England were a doctor, a lawyer, and a professor! Happily the Kodak was not ready for action.

Stören has firm hold of our memory for four reasons: its beautiful situation, its cliffs literally white with the giant *Saxifraga pyramidalis*, its mosquitoes, and the end, to all

intents and purposes, of our overland expedition. For at Stören we are again upon the Christiania-Trondhjem Railway, and only thirty-three English miles from the latter city. After bidding a kindly farewell to the courier and drivers who had brought the party overland from Lillehammer, and being collectively photographed by the various photographic members of the party, we took the short railway run into Trondhjem on the Sunday (July 13) afternoon, hastened on board the St. Rognvald, the flag of which we had seen from our train, and the Vesey Club party was complete. We had crossed Norway by a route which was nearly due north, from lat. 60° to lat. 63½°, and we should now turn our faces southwards, and therefore homewards, though before we actually start for home we still have much to see and to do. This must furnish us, however, with materials for another article.

(To be continued.)

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

ANNUAL MEETING AT LEICESTER.

On concluding his address, Mr. Mott spoke a few words of welcome to the members of the union. He said: Let me assure you, in the name of the Leicester Literary and Philosophical Society, that we desire to welcome in the most cordial and enthusiastic manner all the delegates and friends who have honoured us with their presence, to make your two days here both agreeable and instructive, and to induce you to think of Leicester in future as the abode of many friends, and many sympathisers in those pursuits which you meet this day to cultivate. There is no culture so effective as self-culture, but to get its best results we need not only to observe and to think individually, but also to ascertain what others are observing and thinking on the same lines, and this we can best do by the personal intercourse for which these meetings afford the opportunity. The Midland Union does good service in bringing us together and in cultivating an *esprit de corps* among our scattered societies. Its organ, the "Midland Naturalist," is a useful periodical, which I always read with interest, but it does not satisfy me. Its circulation ought to be five times what it is, but that means that it must be made five times as interesting to the general public. The circulation of a periodical is a practical test on this point. If it interests a large number it will have a large sale. If it has a small sale it is because it only interests a small number. I am inclined to

think that, if the council seriously considered the "Naturalist" from this point of view, means might be adopted for increasing its popularity without injuring its scientific character. We are greatly indebted to its editors for their gratuitous labour during the twelve years of its existence, and I am sure that at this moment the warmest wish of our hearts is—Success to the Midland Union, and a rapid development of the "Midland Naturalist" through all the organic phases culminating in a splendid climacteric, even if it be followed at some far distant period by the inevitable organic death.

Discussion on the President's Address.

Mr. Packe, of Stretton Hall, remarked that it would be quite impossible for one who was unprepared to make any answer to the vein of thought struck out in the very lucid and thought-stirring discourse the president had given them. His comparison of the similarities and the differences of mechanical force and organic force must rouse in all of them many new thoughts and new views. Passing from that to the question of species, he was compelled to say he could not agree with Mr. Mott in his remarks on that particular question. He felt sure that no one who had botanised on the mountain slopes of Europe, where the flowers were subject to so many climatic influences, and had practically to fight for their existence, would ever think of attempting to define species. It would be impossible for them to fix the line.

Mr. Herbert Stone, F.L.S., could not agree with the president that the moment of fission was the moment of death in unicellular organisms. When a single organism divided itself into two by fission they could not say that the original organism had disappeared. It really became two individuals which were the halves of the original one. Death meant a stoppage or cessation of function, and in the case of division of unicellular organisms no function had stopped at all.

Mr. A. T. V. Turner also took part in the discussion. He contended that if Mr. Mott's view was correct as to the relation between nervous force and bodily size, after the expiration of centuries the human race would be in the condition in which Swift represented it in the kingdom of Liliput.

Mr. Mott, in replying to the discussion, said that Mr. Packe had spoken of the great difficulty of defining species, which was perfectly true. In the saxifrages and primulas this was remarkably so, and that might be considered as one of the difficulties of his view of the case. There were difficulties on

both sides, and he quite admitted them on his side. At the same time he thought perhaps in many of those cases a sufficiently wide definition of "species" was not taken. The definition of species was a little indefinite, and when they said that the two saxifrages that had been mentioned were of two different species, possibly if they knew down to the bottom of their constitution they would find they were not two species, only varieties of one species. There was always that possibility, though that did not explain all the interlacing of different forms which did occur, and which formed the difficulty of his theory. Mr. Stone did not think that the moment of fission in a unicellular organism could be the moment of death. That, perhaps, depended on the view they took of life, but when the one individual became two individuals what became of the first individual? There was no longer the one individual, and, whatever definition they put upon it, it had gone, and was certainly defunct. As to Mr. Turner's remark that mankind according to his view would become Liliputians, he did not think that was far out. It was clear that organisms did become smaller as they became more highly developed, and how far that might act on the human race he did not know. It was said that there were giants in the old days, but there were not many of them now. He did not think, however, that the doctrine of ancient giants was very well proved; and they had, too, the South African dwarfs, which seemed to be an early race, which militated against the theory. The evidence on these points, however, was so scattered that they could not judge. He thought, probably, that it would be found in twenty, fifty, or a hundred thousand years that the human race would be comparatively small compared with what they were now. That the nervous development of the human race had not reached its highest, he was sure; and if it went on, the concentration of energy in the nervous tissue would, according to the evidence of past organic experience, have the result that the outer form would be smaller. Men would then have more mind and less body.

EXCURSIONS.

The second day (Friday, September 19th) was as usual devoted to excursions, admirable arrangements for which had been made by the local committee. The locality selected was Charnwood Forest.

Shortly after nine in the morning the intending excursionists, who comprised not only the visiting savants but also a good many local ladies and gentlemen—principally members of the Leicester Literary and Philosophical Society—met at

head-quarters, the Belvoir Street School. It had been previously arranged that the party should divide into two sections, botanists and geologists, and that the former should drive to Swithland, Woodhouse Eaves, and Ulverscroft Priory; while the others should proceed by way of Mountsorrel, Loughborough, Longcliffe, and the Monastery. Newtown Linford was chosen as a convenient rendezvous where the excursionists might again be merged into one party for the purpose of assisting each other to carry out that admirable function—a meat tea.

BOTANICAL.

To deal first with the botanists, it should be premised that, although they were the smaller party of the two, they were animated by an excellent *esprit de corps*, which conduced in a very large degree to the enjoyment of the excursion. It was soon discovered that to be a botanist, on this occasion at any rate, a precise acquaintance with a unicellular organism or a cryptogam was not so much a desideratum as a large capacity for enjoying the more diversified beauties of nature in which the Charnwood neighbourhood is so remarkably rich. It is true that under the skilful and experienced guidance of Councillor Mott, the president of the Union, the really ardent botanists of the party were afforded ample scope for enhancing their knowledge of the Charnwood flora, but the almost numberless other objects of interest seen during the journey claimed their share of admiration. Mr. Mott was quite indefatigable in his efforts to give his party an insight of everything that might be novel or of exceptional interest to them, and he was very ably assisted in this by Mr. Hull and Mr. C. J. Billson, M.A., who formed part of the contingent. The botanists were also fortunate in having amongst them a well-known Yorkshire naturalist, the Rev. E. Jones, of Skipton, whose genial qualities were thoroughly appreciated by all.

The first point of interest after leaving Leicester, and getting just a passing glimpse of the Abbey ruins, was the village of Thurcaston, celebrated as the birthplace of Bishop Latimer. From the high ground about here a grand view was obtained of the Bradgate Hills that stood clearly defined against the blue sky, Old John, with its historic antecedents, claiming particular attention. The land and waterscapes in the vicinity of Cropstone wore a charming aspect, and further on, when Swithland Wood was reached, the magnificent autumn tints of the foliage gave rise to animated comment. Wending their way along the forest path the explorers soon found themselves on the very brink of the great slate pit,

about two hundred feet deep, now in disuse, and containing in one portion water to a depth of some forty yards. The almost perpendicular sides of the pit render it inaccessible except at one place, and this having been pointed out, the spirit of adventure so rife in Englishmen prompted one or two to make a trial of the descent, which was accomplished in safety. The deserted pit had a peculiar weirdness about it which proved something of a charm, and amply compensated for the risk and difficulties of descent and ascent. The immediate vicinity is rich in ferns, sedges, mosses, fungi, and other cryptogams, and among these the true botanists lingered as long as time would allow.

Perhaps the most pleasing feature of the whole journey was a short visit to The Brand. By the courtes y of Mrs. Ellis the excursionists were invited to pass through the park, where the wild beauty of the natural formation isplaced in striking contrast with cultivated tracts, brilliant in the extreme in colour and variety. The drive was then resumed. and Woodhouse Eaves was reached about one o'clock. Beacon Hill was ascended on foot, and from its summit an exceedingly picturesque view was obtained of the surrounding country—the richly-wooded plain on the one hand, and on the other the pretty timber-capped peaks of Bardon and Copt Oak and the other "little hills" that conduce so much to the fine prospect. The highest point of the beacon was made a halting place, where an impromptu luncheon was attacked with vigorous appetites. Then, in a condition nearly akin to "giants refreshed," the excursionists pushed on their journey towards the rocky ridge of Benscliff. Here, unfortunately, they were met by a rain-storm, and the shelter of the trees had to be sought. The party was joined for a short time at Benscliff by Alderman Barfoot and Mrs. Mott. The excursion from this point had, regretfully, to be somewhat curtailed owing to the rain, and a distant view of the ruins of Ulverscroft Priory had to suffice in place of a closer acquaintance with this interesting spot. Returning to Newtown Linford a very substantial repast was partaken of at Beck's, and just at its conclusion the brakes containing the geologists arrived at the hotel.

GEOLOGICAL.

The geological party proceeded in two brakes along the London Road to the granite quarries at Mountsorrel, where the first stop was made. The party was met by Mr. Diggle (managing partner of the quarries), who, with Mr. J. D. Paul, F.G.S. (the leader of the excursion), explained the characteristics and working of the quarry. The blasting

processes were watched, and the crushing of the granite by machinery inspected. After describing the Syenite, Mr. Paul gave the order to re-embark, and the road was resumed. Passing through Quorndon and Loughborough, the Forest Gate Beds were reached, and here a portion of the party left the vehicles to walk over the section of the rocks, a distance of four miles, showing the entire series. At the Forest Rock Inn the party was once more completed, the walking section having passed through Long Cliff, over Ives Head, and by the Monastery.

From the Forest Rock Inn the drive was continued *via* Markfield to Newtown Linford. After tea some of the members walked in Bradgate Park, while others proceeded to Leicester to catch an early train. The driving distance accomplished by the geological party was close on thirty miles, through country interesting both on account of its scenery and its geological features. The walk from the Long Cliff Hotel to the Forest Rock Inn, included the Forest Gate Beds proper, the Coarse Grits and Banded Slates of Nanpantam and Long Cliff, the Banded Grits of Ives Head, the Blackbrook series, the Quartzose Rocks of Oaks Church, the Breccia and Ashes of the Hanging Stones, the Great and Rounded Agglomerate, the Porphyritic Breccia, the Great Breccia Bed and the Indurated Slates of High Towers, and the Porphyritic Rock of Peldar Tor, and on to the fault of Ashby Coalfield with the Keuper Beds atop.

At the close of the tea, a very hearty vote of thanks was accorded to the President (Mr. Councillor Mott) for the excellent arrangements of the day; and, on the part of the geologists, to Mr. J. D. Paul for his leadership, proposed by Dr. Deane and seconded by the Rev. Mr. Mello.

Visitors were supplied with maps of Charnwood Forest, of Leicester, and geological maps and sections for the geological party, all of which added much to the convenience, interest, and instruction of the excursions.

We have received Part XIII. of "The British Moss Flora," by R. Braithwaite, M.D., F.L.S. This forms the first part of Section 6 of this truly beautiful and valuable work. In this the various genera and species belonging to the families Splachnaceæ, Œdipodiaceæ, Funariaceæ, and part of Bryaceæ, are figured and described in the able and graphic style of its talented author. It contains 6 plates, illustrating 23 species, *Œdipodium Griffithii* occupying a full page plate, which is a work of high artistic merit. The price of this part is 6s.; the subscription for the Section, which will comprise Parts XIII. and XIV., 10s. 6d. In the next Part, XIV., the family Bryaceæ will be continued, and, as this will contain descriptions and illustrations of the difficult genus Bryum, it will be of great value to all working bryologists. The work may be obtained of the author, 303, Clapham Road, London.

THE FUNGI OF WARWICKSHIRE.

BY W. B. GROVE, M.A., AND J. E. BAGNALL, A.L.S.

(Continued from page 262.)

421. **L. serifluus**, *Fr.* *Ag. serosus*, With. Woods and pastures. October. Pastures, Edgbaston, *With.* 165, Warwick, *Perceval.* Burton Green Wood and the Castle Moat, Kenilworth, *Russell, Illustr.* Line's Spinny, near Rugby, *Rugby Sch. Rep.* Sutton Park; Cut-throat Wood, Solihull.

422. **L. mitissimus**, *Fr.* Woods and hedge banks. September-October. Warwick, *Perceval.* Crackley and Burton Green Woods, Kenilworth, *Russell, Illustr.* Combe, *Adams.* Baddesley Park, *Hawkes.* Sutton Park; hedge bank, Old Chester Road; New Park; Trickley Coppice; Shawberries Wood, Shustoke; Kingsbury Wood; woods, Maxstoke; The Grounds, Hampton-in-Arden; Coleshill Pool and Heath; Four Oaks; Grove Park.

423. **L. subdulcis**, *Fr.* *Ag. dulcis*, With. *Ag. lactifluus*, Purt. Woods. September-October. Plantations, Edgbaston, *With.* 171. Oversley Wood! Purt. ii. 625. Warwick, *Perceval.* Crackley Wood, Kenilworth! *Russell, Illustr.* Hopsford! *Adams.* Sutton Park; New Park; Trickley Coppice; Bradnock's Hayes; School Rough, Marston Green; Shustoke; Coleshill Pool; Packington Park; Edgbaston Park; Shirley Street; Grove Park; Haywood, &c.

424. **L. camphoratus**, *Fr.* *Ag. cimicarius*, With., Purt. *Ag. camphoratus*, Purt. Woods. August to November. In the park, at Packington, *With.*, 171. Coughton Park, in the thickest part of the wood, *Purt.*, iii., 192. Oversley Wood, *Purt.*, iii., 193. Trickley Coppice; Haywood; Kingsbury Wood; Edgbaston Park.

Genus IX. RUSSULA, *Fr.*

425. **Russula nigricans**, *Fr.* *Ag. elephantinus*, With., Purt. Woods. Sept.-Oct. Edgbaston Park! *With.*, 194. Ragley Woods and Park! *Purt.*, ii., 204. Warwick, *Perceval.* Birmingham Road, Kenilworth, *Russell, Illustr.* Combe Woods, *Adams.* Sutton Park; Trickley Coppice; New Park; Shawberries Wood; Kingsbury Wood; Water's Wood, Maxstoke; Whey-porridge Lane, Solihull; Oldbury Wood, near Mancetter; Hazelwood, Honiley; Oversley Wood; Coleshill; Marston Green; Umberslade; Spernall, &c.

426. **R. adusta**, *Fr.* Woods. Oct. Rare. Combe Ridings, *Adams.* Coleshill Pool; New Park; Trickley Coppice; Whey-porridge Lane, Solihull.
427. **R. delica**, *Fr.* Rare. Birmingham Road, Kenilworth, *Russell, Illustr.* Combe, *Adams.* Kenilworth, 1882! *Cooke, Illustr.*, 1068.
428. **R. furcata**, *Fr.* Woods. Sept.-Oct. Barton Green Wood, Kenilworth, *Russell, Illustr*, Corley, *Adams.*
429. **R. sanguinea**, *Fr.* *Ag. integer*, var. 4, *sanguineus*, With. Edgbaston, *With.*, 191.
430. **R. rosacea**, *Fr.* Woods. Rare. Sept.-Oct. Wedgnock Park, *Perceval.* Burton Green Wood, Kenilworth, *Russell, Illustr.* Crackley Wood, Kenilworth, in the company of *Dr. Cooke*, Oct., 1883.
431. **R. sardonia**, *Fr.* Fir woods. Rare. Bubbenhall, near Warwick, Sept., 1852, *Russell, Illustr.*
432. **R. depallens**, *Fr.* Woods and fields. Sept. to Nov. The Dale, Kenilworth, *Russell, Illustr.* New Park; Trickley Coppice; footways near Coleshill Pool; Sutton Park; Marston Green; Edgbaston Park.
433. **R. drimeia**, *Cooke.* Woods. Rare. Oct.-Nov. Pine wood, Coleshill Heath; named by *Dr. Cooke.* Sutton Park.
434. **R. virescens**, *Fr.* Woods. Rare. Aug. to Oct. Crackley Wood, Kenilworth, *Russell, Illustr.* Combe, *Adams.* Near Hams Hall; Sutton Park; Marston Green; Umberslade.
435. **R. lepida**, *Fr.* Woods. Rare. Red Lane, Kenilworth, *Russell, Illustr.*
436. **R. rubra**, *Fr.* Woods. Aug. to Oct. Burton Green Wood; Crackley Wood, Kenilworth, *Russell, Illustr.* New Park; Trickley Coppice, in company of *Dr. Cooke*, Coleshill Pool; The Spring, Kenilworth; Sutton Park; Packington Park.
437. **R. Linnæi**, *Fr.* In woods. Very rare. Oct. Crackley Wood, Kenilworth, Oct., 1885! *Cooke, Illustr.*, 1026.
438. **R. vesca**, *Fr.* Woods. Rare. Oct. Warwick, *Perceval.* Sutton Park, in company with *Dr. Cooke*, 1888.
439. **R. cyanoxantha**, *Fr.* Woods, &c. Frequent. Sept.-Oct. Birmingham Road, Kenilworth, *Russell, Illustr.* Combe Ridings, *Adams.* Sutton Park; New Park; Trickley Coppice; Edgbaston Park; Packington Park; Bentley Park; Ironstone Wood, Oldbury; near Coleshill Pool; Plant's Brook; Solihull; Maxstoke; All Oaks, Cathiron Lane; Coughton Park; Haywood; Austey Wood; Wootton Wawen; Corley; Ladies' Wood, Ragley; Berkswell; Marston Green; Shirley Street, &c.

440. **R. heterophylla**, *Fr.* Woods, Warwick, *Perceval.* The Dale House Lane, Kenilworth, *Russell, Illustr.* Combe Woods, *Adams.* Fen End; Marston Green.

441. **R. consobrina**, *Fr.* Var. *sororia*, Larbr. Woods. Rare. Oct. Gathered in Trickley Coppice, Middleton Heath, in company of *Dr. Cooke*, 1884.

(To be continued.)

BIOGRAPHICAL INDEX OF BRITISH AND IRISH BOTANISTS.—This work, by James Britten, F.L.S., and G. S. Boulger, F.L.S., is a reprint, materially enlarged, of a series of papers which have appeared in the "Journal of Botany" during the last three years, and will shortly be published in book form by subscription, the price to subscribers being 4s. per copy. It will embrace a short biographical sketch of all known British and Irish botanists from earliest times to 1890, giving the dates of their birth and death, places of burial, degrees, and scientific work. Subscribers' names may be sent to Messrs. West, Newman, and Co., 54, Hatton Garden, London, E.C.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—October 28th. THE ANNUAL CONVERSAZIONE was held at the Mason College, 229 members and friends being present. A very interesting and beautiful series of coloured drawings was exhibited by Councillor Wallis of scenes in India, Ceylon, China, Japan, &c., drawn by himself during a tour round the world. A fine collection of butterflies was shown by Mr. George Kenrick, illustrating the connection between the white butterflies of the world. Mr. Chase exhibited his unequalled collection of young birds in the down, most beautifully prepared in separate groups; the groups corresponding with the number that are hatched in the nest of each different bird. Mr. Hague exhibited, in the living state, two albino specimens of the song thrush, which were hatched in the neighbourhood, and had been reared by him from the nest, and kept in health for three years. A series of cases of British birds' eggs was exhibited by Mr. Hodgson, and a collection of insects by Mr. Bradley; and leaf insects and beetles from Eastern Bengal were shown by Mr. Walliker. An almost complete series of British reptiles was exhibited by Mr. Shrive. Minerals were shown by Mr. Butler and Mr. Woodward; and a number of fine specimens of remarkable rocks from Norway, by Dr Lapworth. An interesting marine aquarium was exhibited by Mr. Blakemore, which he had kept in healthy condition for more than a dozen years without renewal of the sea water. Two ants' nests were exhibited by Mr. Martineau, showing the live ants and their processes of working, under a glass cover. Mr. Vester contributed a series of dried plants from Palestine, the colours being beautifully preserved. A series of American plants was shown by Mr. Marshall, collected by him in California, Colorado, &c. A number

of lantern slides were exhibited as transparencies, including a series, hand-painted from the microscope, by Mr. Underhill; various photographs by Mr. Edmonds and Mr. C. Pumphrey; a Norwegian series, by Mr. Wm. Pumphrey, and views of Niagara, by Mr. G. Hadley; and a large number of microscopic and other photographs by Mr. Watson, taken when in Norway with the Vesey Club. In a large number of microscopes were exhibited interesting specimens of various living and mounted objects. On the walls was shown the fine collection of diagrams that had illustrated Dr. Milnes Marshall's recent very interesting lecture to the society on "Animal Pedigrees." The room was handsomely decorated with plants that were kindly lent by Mr. Spinks, of Messrs. Hewitt's Nurseries, Solihull. In the course of the evening the President, Mr. Charles Pumphrey, gave an address describing the various objects of interest that were exhibited, and referring to the special objects and pursuits of the society, expressing a cordial welcome to the visitors present, and an invitation to join the society. Microscopical Section.—November 4th. The President, Mr. C. Pumphrey, in the chair. Two new members were proposed for election. Exhibits:—Mr. Carpenter, a selection of beautiful specimens of brain-coral, of two kinds, one with polype cells in wandering channels, ¼in. to 1in. long; the other with single separate hexagonal polype cells, ten per inch, or 100 per square inch, thus making about 6,000 on the whole surface of the specimen. Mr. Bolton, under the microscope, living specimens of *Volvox globator*, containing within their spheres minute organisms, *Proales parasita*, which swim about within the volvox like gold-fish in a globe of water. Their structure and habits have been described by Hudson and Gosse. Mr. W. H. Wilkinson exhibited a number of reflectors of different sizes, forms, and materials, and described the particular purpose for which each was best suited. He then described the most approved method of illuminating subjects for the microscope, both by transmitted and by reflected light. Afterwards Messrs. Pumphrey, Levick, and others gave some hints as to how they had obtained the finest results.—Biological Section. November 11th. Mr. Chas. Pumphrey in the chair. Messrs. J. C. Stackhouse and Robert Mann were unanimously elected members. Mr. W. H. Wilkinson exhibited a blossom and leaf of *Cobœa scandens*, also fruit of *Cydonia japonica* from his garden, also *Xylaria hypoxylon*, and several species of fungi from Wellington, Salop. Mr. T. V. Hodgson exhibited a case of butterflies and moths, illustrative of colour in animals. The purely protective forms represented by the Leaf Butterfly (*Kallima inachis*), the Herald Moth (*Gonoptera libatrix*), and the Hornet Clearwing (*Sesia apiformis*); warning colours by *Danais archippus*, an Heliconia; mimetic by a Pieris and Gold Tail Moth, *Liparis auriflua*. —Geological Section. November 18th. Mr. T. H. Waller, B.A., B.Sc., in the chair. A paper was read by Mr. C. J. Watson on "Rocks in Norway," illustrated by photographs taken by Mr. C. J. Watson during the recent excursion to Norway. With his usual kindness, Mr. C. Pumphrey exhibited the slides by means of his own lantern. The section was indebted to Professor Lapworth, F.R.S., for his explanation of the geological problems revealed by the photographs. Professor Lapworth pronounced some of Mr. Watson's photographs, from a geological point of view, to be among the best ever taken. He specially named those of certain "Augen Gneisses." A most cordial vote of thanks was given to Mr. C. J. Watson, Mr. C. Pumphrey, and Professor Lapworth. Mr Pumphrey then exhibited a series of photographs taken in Yorkshire and elsewhere during the meeting of the British Association at Leeds.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—October 20th. Mr. J. Madison presented to the society the first instalment of a collection of British land and freshwater shells. A vote of thanks was accorded the donor. Mr. G. H. Corbett showed part of vertebra of Ichthyosaurus from Lower Lias clay, Stratford-on-Avon. A lecture was then given by Mr. T. H. Waller, B.A., B.Sc., on "Sands and Clays." The lecturer said a few years ago granite was believed to be the lowest rock in the earth's crust, nothing being known below it; and it was supposed that this had been broken up and formed the mica schists. This theory of the origin of crystalline rocks was not generally accepted now. Slates were formed by the breaking up of older rocks, but great changes had since gone on to alter them. The various agencies were reviewed by which rocks were broken up, decomposed, and their different materials sorted. Clays were formed of hydrous silicate of alumina. China clay (kaolin) owed its origin to the decomposition of felspathic granite, and the small quantity of tin it contained was probably brought from the interior of the earth in a gaseous form by volcanic agency. Sand grains were sometimes well rounded and others angular; the former rather pointed to a desert surface than to water action, as the abrading power of water on such atoms was very limited. When clays were washed and the residue placed under the microscope, crystals of zircon, rutile, tourmaline, &c., were made out. These crystals being found in granite give evidence of their derivation from that rock. At the close of the lecture the process of washing was shown, and six typical slides of clay washings from different localities presented to the society's cabinet.—October 27th. Mr. Linton exhibited a green flower of Dahlia, all the petals having degenerated into foliage leaves; Mr. J. Madison, a series of sketches of fresh-water operculate shells from Lake Tanganyika; the resemblance they bear to some marine types points to the possibility of the lake once having been salt. Mr. P. T. Deakin then read a paper on "Some Gloucestershire Shells." The writer said the shells he should speak of were collected during a walk that extended over about twenty miles. It commenced at Cheltenham, and was continued through Leckhampton, Charlton King's, Seven Springs, Cooper's Hill, to Gloucester. The shells found in the different localities were enumerated. Some observations were made on *Helix pomatia*, kept in confinement, and their method of constructing summer and winter epiphragms. The shells collected were shown. November 3rd.—Annual Meeting. In the unavoidable absence of the President through illness, Mr. Haynes, B.Sc., was unanimously voted to the chair. The reports of the General Secretary, Secretary of Committee, Curator, and Treasurer (the latter stating there was a balance of £3 16s. 3d. in favour of the society) were read and formally passed. Mr. J. W. Neville then proposed the re-election of Professor Hillhouse, M.A., F.L.S., as president for the ensuing year, remarking that the many pleasant recollections of that gentleman's year of office had made the society very desirous of securing such services for another year. Mr. G. H. Corbett seconded the resolution, which was passed unanimously. Mr. P. T. Deakin proposed Messrs. Cracroft and Parker as vice-presidents. Mr. J. Madison seconded the same, which was passed. The other officers remained unchanged. After a vote of thanks to the retiring officers had been moved and passed, Mr. Rodgers moved a vote of thanks to the Birmingham Natural History and Microscopical Society for their kind invitations from time to time to lectures given at Mason College, which was passed unanimously. After the election of the committee, Mr. Haynes, B.Sc., read the retiring President's address, the subject of which was "Smatterings."

The writer said, among the many honours conferred on him in Birmingham, one was receiving an invitation to become a fellow-worker with this association, and it now became his duty to lay his offering of peace on their altar. Some proverbs were here mentioned, the writer remarking that proverbial philosophy will sometimes lead us astray. Some sayings were too rigidly true ; others were really false. Superficial knowledge was smattering. This was an age of specialisation—of the division of labour—an evil for which we shall some time have to pay a heavy price for the loss of our skilled handicraftsmen. Specialise if you will, but overcome the evil by smatterings. Fill the mind with knowledge, for it will be active ; it may be active in trivialities or realities. The writer spoke of the exacting nature of mental work compared with muscle work, but the first could be partly overcome by walking exercise, to which a great additional interest would be attached by a little knowledge of geology, botany, or archæology. If all knowledge cannot be our property, let us have common rights. Become searchers after knowledge, take her to your hearts and minds, for hers is the beauty of the universe.—November 10th. Mr. H. Hawkes showed a small collection of Alpine plants from Switzerland, including specimens of *Gentiana bavarica*, *Hodisarium obscurum*, *Soldanella alpina*, and *Viola calcarata* ; Mr. J. Madison, sketches of land shells (Achatinæ) from Central Africa ; Mr. G. H. Corbett, ganoid scales of fish from Purbeck beds, Swanage. Mr. J. W. Neville then read a paper on "Some Peculiar Modifications of Insects' Mouths." The writer took as a type the mouth organs of *Blatta orientalis*, which he described as a good specimen of a normal type, all the parts being well developed and none of them highly specialised. The insects spoken of were the mosquito and gadfly. The different parts of the mouth organs were described in detail and compared with the type specimen, showing in both instances very marked specialisation. The sexes differed to a considerable degree, the females in both insects only having the full complement of organs. The paper was illustrated by a series of drawings.

DERBYSHIRE ARCHÆOLOGICAL AND NATURAL HISTORY SOCIETY.—October 14th. A well-attended meeting of the Natural History section took place at Smith's Rooms, Mr. H. Arnold-Bemrose, M.A., president of the section, in the chair, when Mr. F. J. R. Carulla, who was for many years connected with the iron and steel industries in various capacities, gave a paper on "The Development of the Age of Steel." The discovery of iron implements more than 1,500 years old, made at the Roman city of Silchester by Mr. St. John Hope, afforded the lecturer an apt illustration of the interest that the subject of the evening should have for the archæologist, who must take cognisance of the development that is going on around him in order thoroughly to understand the problems that engage his special attention. In this respect he is like the palæontologist, who cannot ignore the investigation of the biologist on the subject of existing species, studies that throw the clearest light on the nature of the animals and plants of past ages. The development of the steel manufacture from the time of Huntsman and the older processes to the more modern ones of Bessemer and Siemens was traced, Robert Mushet coming in for a due share of notice. It may be news to many that the first rail of Bessemer-Mushet steel (commonly called Bessemer steel) ever laid down was at the Midland Station, Derby. This rail did good service from early in 1857 to the middle of 1873 in a part of the line where iron rails had to be renewed every six months and occasionally within three months. The paper

was illustrated by specimens of steel, a number of diagrams, and portraits of the inventors.—In opening the discussion, Mr. Arnold-Bemrose reminded the section that there was a precedent for a subject of the kind selected, Dr. Sorby, F.R.S., having a short time ago favoured the society with a most interesting lecture on "The Microscopical Structure of Iron and Steel." He felt, however, that when subjects of this nature were treated, unless specialists were present, questions would have to take the place of a discussion. A number of these were asked by Dr. Copestake, Dr. Greaves, Dr. Carter Wigg, Mr. G. Hyde, and others, the discussion terminating with a vote of thanks to Mr. Carulla.

OXFORD NATURAL HISTORY SOCIETY.—First Meeting of the Session. October 23rd. In Professor Burdon-Sanderson's Lecture Room. The President, Mr. E. B. Poulton, M.A., F.R.S., in the chair. After the confirmation of the minutes, Mr. John W. Shipp, 51, Cowley Road, was proposed by Mr. H. M. J. Underhill, seconded by Mr. M. S. Pembury. It was then proposed from the chair that the day of meeting should be altered from Tuesday to Thursday. A considerable majority of members present signified themselves in favour of the alteration, which was therefore carried. The President then called on Mr. Underhill to give his lecture on "Artistic Japan: Birds, Beasts, and Fishes." The lecturer showed a number of water-colour copies of Japanese pictures of animal life, with the aid of a lime-light lantern. He began with aquatic animals, the most striking of which was a huge octopus squeezing a man to death, by Hôkusai, of Yedo. Four-footed animals were then shown, among which may be mentioned some rough, but very vigorous, sketches of horses, some most expressive monkeys, and a very fierce and huge tiger. The second half of the lecture was entirely devoted to birds. The most conspicuous of these were, perhaps, some bull-finches, a flight of tomtits (green and yellow) leaving their nest at daybreak; ducks swimming and flying, a very fine cock and hen seated on a drum, and two handsome pea-fowl (also cock and hen) in a pine tree. The lecturer pointed out that the chief characteristics of these Japanese animal pictures are—first, that the animals are themselves the *picture*, they form the motive of interest, and are not, as in most European pictures, mere "accessories" to a landscape, or a figure subject. This quality led the Japanese to make pictures of all sorts of animals that came in their way, instead of merely confining their attention, as we do, to horses, dogs, and cattle. The next striking thing about them is that they are *full of life.* Mr. Stacy Marks's birds are all still, on perches; but the Japanese birds are all in motion, walking, swimming, or flying. In this respect they excelled European artists, although in perspective and light and shade they are almost always entirely wrong. In the course of the lecture, Mr. Underhill gave two Japanese folk-stories about animals, with Japanese illustrations; and at the close, some albums of bird-pictures, &c., containing the originals of many of the slides shown, were exhibited.—On Nov. 6th Professor A. H. Green, M.A., F.R.S, read a communication from Mr. Jukes Brown, of the Geological Survey, on a boring at Shillingford, near Wallingford, Berks. A report of the paper will appear in this magazine.—On Nov. 20th the President of the Society (Mr. E. B. Poulton, M.A., F.R.S.) gave his lecture upon "Mimicry amongst Animals, and their Colours, protective and aggressive." It was illustrated with a large number of lantern slides. The lecture was listened to with more than usual interest, and the room was quite full.